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PUBLIC HEARINGS ON NOISE ABATEMENT AND CONTROL. VOLUME I. CONSTRUCTION NOISE, MEETING HELD IN ATLANTA, GEORGIA ON JULY 8-9, 1971

Environmental Protection Agency
Washington, D. C.

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Public Hearings on
NOISE ABATEMENT AND CONTROL

Vol. I — Construction Noise

Atlanta, Georgia July 8-9, 1971

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the
Office of Noise Abatement and Control

U.S. Environmental Protection Agency
Washington, D.C. 20460

[redacted]

PREFACE

Under the Noise Pollution and Abatement Act of 1970 (Title IV to the Clean Air Amendment of 1970 (PL 91-604), the Environmental Protection Agency, through the Office of Noise Abatement and Control, is required to hold public hearings. A series of eight of these hearings is being conducted in selected cities to aid the office of Noise Abatement and Control in compiling information relevant to its investigation of the Problem of Noise Pollution. Further, these hearings present an opportunity for the public and industry to express their viewpoints on the general subject of noise control. The volumes in the complete series will be:

Vol. I —Noise in Construction

Vol. II —Manufacturing and Transportation Noise (Highway and Air)

Vol. III —Urban Planning, Architectural Design; and Noise in the Home

Vol. IV —Standards and Measurement Methods, Legislation and Enforcement Problems

Vol. V —Agriculture and Recreational use Noise

Vol. VI —Transportation (Rail and Other), Urban Noise Problems and Social Behavior

Vol. VII — Physiological and Psychological Effects

Vol. VIII—Technology and Economics of Noise Control; National Programs and their Relations with State and Local

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ENVIRONMENTAL PROTECTION AGENCY

PUBLIC HEARING ON CONSTRUCTION NOISE

THURSDAY, JULY 8, 1971

The hearing was convened at 9:15 a.m., Dr. Alvin F. Meyer, Jr., Director, Office of Noise Abatement and Control, Environmental Protection Agency, presiding as Chairman.

PANEL:

Dr. Erich Bender, Bolt, Beranek & Newman

Dr. D. Lyons, Clemson University

Mr. R. A. Baron, Citizens for a Quieter City

Mr. Gerald P. McCarthy, Governor's Council on the Environment, State of Virginia

Dr. Daniel A. Okun, University of North Carolina

PROCEEDINGS

Dr. **Meyer**: Ladies and gentlemen, I would like to call to order this public hearing on problems of noise as an environmental insult. I would like to make a few brief remarks regarding on how we intend to conduct this hearing and then a few introductory statements after I have introduced the panel.

These hearings are held in response to an act of Congress, Title IV of Public Law 91-604, which requires that the Environmental Protection Agency prepare a report to the Congress and, in preparing that report to the Congress, undertake some research, make some extensive studies on the state of knowledge regarding noise as an environmental problem, and then to hold a series of public hearings to adduce as much information as possible from a cross-section of professional and civic and public interests.

To do this in an orderly manner, we are conducting a series of hearings, each with a central theme. The one today is dealing primarily with the problems of noise associated with the construction industry.

In order to make it more meaningful, we have decided that instead of having a panel consisting of perhaps only the Federal expertise, we should bring together diverse public and professional interests to serve with me in representing the Administrator. So that you may get some idea of the types of people on the panel, I will introduce them at this point.

I am Alvin Meyer, the Director of the Office of Noise Abatement and Control of the Environmental Protection Agency. Normally I would be accompanied by Mr. Tolman, the Regional Coordinator of EPA. Unfortunately he is deeply involved in some very specialized activities this morning and extends his regrets, but he may be here shortly.

Without any indication as to rank, position, or professional stature, I am going to go alphabetically.

I have on the panel with me Dr. Erich Bender, who is on my immediate right and who is an acoustical and noise control expert of the firm of Bolt, Beranek & Newman, who are also contractors and consultants to our office.

I have Professor Lyons of Clemson University. Professor Lyons, as some of you may have read, has been extensively involved in studies on quieting of machinery and equipment.

I have Mr. Baron who is a noted author and representative of an organization called Citizens for a Quieter City and is a leading civic expert and an individual with great concern for the problems of noise as it affects our modern society.

I have Mr. Gerald P. McCarthy representing the Governor's Council of the State of Virginia. He brings knowledge and understanding of problems of the environment as a larger issue.

And I have Dr. Daniel Okun, Department of Public Health, University of North Carolina, School of Public Health, and immediate Past President of the American Academy of Environmental Engineers and a long-time worker in the general field of engineering in relation to the environment.

In conducting this hearing, I plan to follow, in general, the pattern of a Congressional oversight hearing in which we have a series of invited witnesses. Members of the panel will be requested to ask questions after those presentations. Or if some question arises in their minds during the course of a presentation, by request they may direct a question to the witness.

Somewhat different from a Congressional hearing, questions from the audience will be directed to a witness. If those questions are written down and given to our clerk, Miss Eileen Brown, we will, time permitting, utilize them.

Now, I would like to make a few further remarks and then proceed to the business at hand.

As most of you know, the Environmental Protection Agency is a new organization established by President Nixon late last year, and its purpose, of course, is to protect all aspects of the environment.

When the Agency was set up last December, our principal concerns were air and water pollution, solid waste management, pesticides, and radiation. However, the amendments to the Clean Air Act, Title IV, of Public Law 91-604, which I just alluded to, added to the aims another area of environmental concern. That title called for the establishment of an Office of Noise Abatement and Control, with the principal role at the present time of identifying and classifying causes and sources of noise, to determine their effects on public health and welfare. And, as I have mentioned, in accordance with that we are holding these public hearings.

Now, the information we are gathering will be included in a report to the Congress, which we are going to submit shortly before the end of the year, so these proceedings do have major importance from a viewpoint of providing information not only to the Agency but to the Congress.

It certainly is not going to come as any surprise to you that the average American is literally surrounded by noise—on the job, at home, and even at play. And as an aside, the recreational noise problem is one that seems to be increasing at a faster rate than even some of the others.

In the urban areas, where three-fourths of our population is located, the general din and hum of construction projects, the roar of air and surface transportation, and the incessant cacaphony of industrial noise are practically ceaseless.

Within the past 10 years, the overall levels of noise have been sharply increasing. According to some estimates, in large cities noise levels are rising 1 decibel per year. Such an increase represents in 10 years a doubling in the loudness of sounds reaching the human ear and an approximate tenfold increase in acoustical energy in the environment. Only last month, an international group of experts meeting in Switzerland warned that people living in the noisiest parts of cities around the world may have definite hearing losses by the year 2000 unless noise is controlled.

Right here in Atlanta, if we were to take a noise level meter such as this one (indicating) or this much simplified one (indicating) into downtown areas, we would find street noise levels at some locations in the same ranges that are prohibited by Federal law inside factories for an 8-hour-day exposure. So we are really not talking about future problems. We are talking about those that we have here today.

Transporatation, construction, and heavy industry are important contributors to environmental noise, but they are not the only ones. We are all aware of noise from our neighbors' air conditioners, our neighbors' lawnmowers, and other types of power equipment used in and around our homes. These are also problems. In fact, noise levels in apartments and private homes, particularly in kitchens and workshop areas, begin to approach those in factories.

Now, some governmental authorities in this country have managed to enact noise control ordinances, but they vary widely, ranging from overly restrictive and impractical to completely ineffectual. Moreover, these ordinances are difficult to enforce because of economic, social, or political considerations, as well as the very real problems associated with detection and proof of violation.

The adoption of more flexible building codes could help cut down noise. Power generators can be quieted. Just as automobile tires can be made with quieter treads, similarly noise control can be built into the design phase of other equipment and machinery, as we will hear more of today.

We do know something about the problem of environmental noise and its control, but we do not know nearly enough about what can and should be done. Even if this agency were not required by law to hold such hearings as this, I am sure we would be holding them anyway, because we must know where we stand, especially regarding public attitudes toward the problems.

Our witnesses today will include major manufacturers of construction equipment. We will also hear from other industries and professions with major stakes in this effort. We will hear from representatives of the academic world, from those associated with private research and engineering firms, and from other interested and informed groups.

EPA comes to this meeting with no preconceived opinions or positions other than that noise is a growing environmental problem that must be controlled. I am sure that we will hear that this is impossible and that one thing or the other must or must not be done. And all of this is to the good. We need the facts to make an intelligent report to Congress and to shape our future program activities.

As Administrator Ruckelshaus recently pointed out, and I quote, "The man who takes responsibility has to be aware of the facts before he issues regulations. If he has to change the regulations after they are issued because he didn't know the facts, he really looks foolish."

While this Agency is not in the noise regulation business yet, it seems inevitable that we will be, and we will see that what is said here today and tomorrow will be reflected in Federal legislation and Federal action.

I have already introduced the members of the panel, and without further ado I would like to move to the business at hand and introduce Miss Alice Suter, representing the National Association of Speech and Hearing Agencies, who will talk about the effects of noise on hearing, particularly of construction workers.

Miss Suter, would you kindly come and join us? We have a place for you. We welcome you here.

STATEMENT OF ALICE SUTER, NATIONAL ASSOCIATION OF HEARING AND SPEECH AGENCIES

Miss SUTER: Thank you, Dr. Meyer.

First of all, it is the National Association of Hearing and Speech Agencies. We put "hearing" first. Our particular agency does anyway.

Also I would like to invite the panel to question me at any time during the presentation on anything that comes up.

You will probably hear the definition of noise a number of times during the next two days as "any unwanted sound"—unwanted because it is either too loud or because it is unpleasant. People refer to it often nowadays as being noxious.

However, the concept of "unwanted" must be qualified since some sounds can be unwanted to some people and yet wanted quite a bit by others. The motorcycle which roars down the quiet lane, shattering a family's Sunday afternoon peace, may have been carefully unmuffled by its driver. I understand that even the Yamaha people are distressed by the "home improvements" often given to their motors.

Likewise, Joshua's war cries at Jericho must have set up a horrible din. However, they produced the desired effects, and the result has come down through history as a religious triumph.

Rock music is another example of the ambiguity of noise. Some love it, and some hate it. But despite the probability that continuous exposure is bound to cause some amount of damage to the hearing mechanism, this fact doesn't seem to diminish its popularity.

Aside from some of the "groovy" aspects of noise, the fact is that background levels of noise in urban areas have been doubling every ten years for at least the past 30 years, just as Dr. Meyer brought out. In some areas they have been growing even faster.

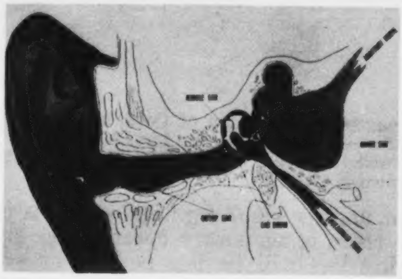
It is popular recently to say that if noise increases at its present rate we shall all be stone deaf by the year 2000. Perhaps I am overly optimistic. However, I don't believe that this will happen. There is growing awareness nowadays that noise really is affecting our ears, bodies, and mental health and that it is past time when something should be done about it.

Perhaps one reason why noise abatement is a latecomer in the field of ecology is because it is insidious. It causes no pain and little physiological discomfort until it reaches high levels. There is no blood, except perhaps in the case of an explosion, and hearing loss due to noise generally occurs gradually over a considerable length of time. I have a friend who says he wishes that ears would bleed when hazardous levels of noise are reached. Then people would pay attention. I suppose if that were the case, residents of certain large American cities would require frequent transfusions.

In talking about the harmful effects of noise, I have decided to divide them into the effects on hearing, on the body as a whole, and on what we call "the quality of life." Although none of these areas is very well understood and a great deal of research needs to be done, the effect of noise on hearing is perhaps the best known of the three.

There is a popular misconception that noise hurts or even shatters our eardrums. Actually, the eardrum is not affected except in the case of an exposure to a blast. Instead, it is the delicate structures of the inner ear which are damaged.

Could I have the first slide, please.



Slide 1. Schematic crossection of the hearing mechanism. From the audio-visual demonstration "How They Hear", written and narrated by Earl R. Harford, Ph.D., Gordon N. Stowe & Associates, Northbrook, Illinois.

This picture is a cross-section of the hearing mechanism. On the left you see the part of the ear with which we are the most familiar. Then just inside the eardrum is the middle ear, containing the three little bones called the maleus, incus, and stapes, popularly known as the hammer, anvil, and stirrup. The promary purpose of the outer and middle portions of the ear is to regulate, and usually to amplify, the sound vibrations for the benefit of the inner ear.

On the right you will see the inner ear which acts as the sensory receptor, that part which changes the sound from mechanical to electrical or neural energy. It is not really blue like that. That's just for clarity. Once the sound signal is received and coded by the inner ear, it is sent on to the brain.

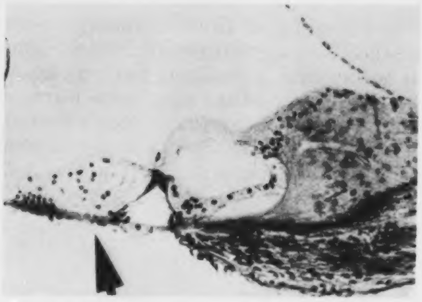
The auditory part of the inner ear resembles a tiny snail and is called the cochlea. It is divided into three chambers which are filled with fluid. Located on a membrane in the middle chamber is a microscopic mound of cells called the organ of Corti where the sound vibrations are translated into neural messages.

Could I have the next slide, please.

(Slide 2)

Sitting on this membrane are four rows of minute tufted cells referred to as hair cells or ciliated cells, When sound occurs, the vibrations pass through the outer and middle portion of the ear and cause the fluid in the inner ear to vibrate. These vibrations are picked up by the hair cells and transmitted quickly to the brain.

When very lound sounds occur, the delicate hair cells can be damaged. In some cases when the sound is not too intense the cells can become fatigued but normal hearing returns after a few hours. However, with very intense sounds such as those produced by heavy artillery, the tiny hair cells are shaken loose or even blown apart by the intensity of the vibration. Once the hair cells are destroyed, there



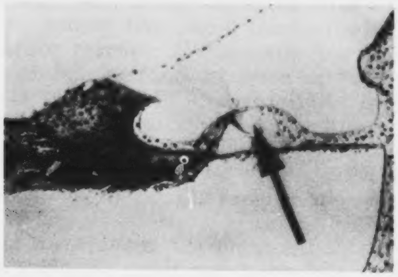
Slide 2. Photomicrograph of the organ of Corti in the inner ear, (cat), From "Stimulation Deafness" by Michael M. Paparella and William Melnick, in *Sensorineural Hearing Processes and Disorders*, A. Bruce Graham, Ed., Boston, Little, Brown & Co., 1967.

is no regeneration, and the resulting hearing loss is permanent.

In cases where there is temporary hearing loss but subsequent recovery, the hearing loss will become permanent after repeated exposures to the same levels of noise. As the hair cells are repeatedly overstimulated, they begin to degenerate.

This side actually shows a small amount of outer hair cells damaged although it is somewhat hard to see. The arrow points to them. Actually they are just very slightly damaged.

Let's have the next slide, please.



Slide 3. (same reference as slide 2). Some hair cell damage is evident.

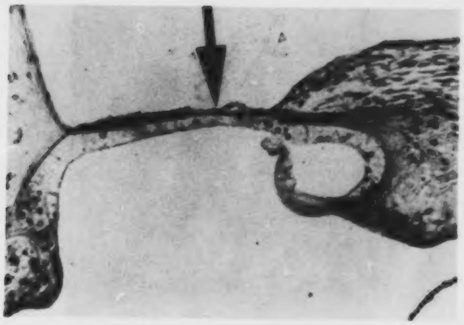
This slide shows additional hair cells missing after a more prolonged or severe exposure to noise. You can see the empty space among some of the outer cells. See where the arrow points to.

Next slide, please.

(Slide 4)

This slide shows the result of extreme injury, and you can see that the hair cells are completely gone and the membrane is flat. This amount of cellular damage would produce considerable hearing loss, at least for those sounds which would be received by this portion of the inner ear.

Now, the whole inner ear doesn't necessarily need to look like this, but this particular area which is damaged is probably towards what



Slide 4. (same reference as slide 2). Shows severe damage to the organ of Corti.

we call the basal end of the cochlea, which is closer to the middle ear where the sounds first reach the inner ear. It is the most vulnerable area.

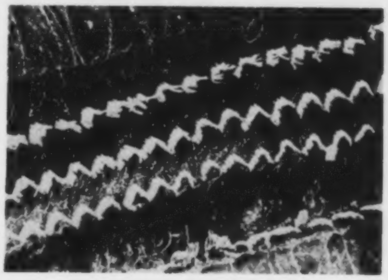
Could I have the next slide, please. (Slide 5)

These two pictures illustrate the process even better. This view looks down on the hair cells as if you were in the central chamber of the cochlea. It shows the four rows of hair cells in their normal condition. Next slide, please.

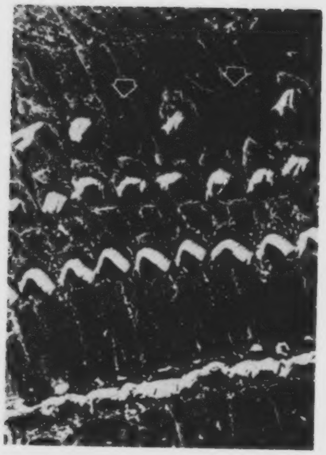
(Slide 6)

This picture shows the outer row consideraby damaged and the next row slightly damaged. The arrows there point to the outer row, and you can see there are lots of those cells missing. The next row is not quite normal either. The inner row tends to hold up the longest, apparently because those cells are the most firmly supported.

One rather interesting finding from research on animals shows that certain amounts of noise can produce temporary hearing losses which disappear after a number of hours. However, when the animal's ear is sectioned and seen under a microscope, large numbers of the outer cells are missing. This fact would lead us to wonder if the temporary loss of hearing experienced after an afternoon with a jackhammer or an evening at the discotheque would really leave us with some



Slide 5. Electron micrograph of the normal organ of Corti, (guinea pig), showing hair cells greatly magnified. From "Normal Structure of the Organ of Corti and the Effect of Noise-Induced Cochlear Damage" by Hans Engström, Harlow W. Ades and G. Bredberg, in *Sensorineural Hearing Loss*, A Ciba Foundation Symposium, G. E. W. Wolstenholme and Julie Knight, Ed., London, J. A. Churchill, 1970.



Slide 6. (same reference as Slide 5). Hair cell damage to the outer row of cells is indicated by arrows.

permanent damage in the inner ear, even though our hearing seems to have returned completely.

In this instance it is not the immediate future which concerns us, but rather the prospect of hearing loss in middle and old age. If a young person is already missing a number of hair cells, the chances are that by the time he is eligible for old age hearing loss he would be more susceptible. He woud really have a head start.

However, before we approach the problem of old age hearing loss, I would like to say more about the causes and types of noise-induced hearing loss.

The most common source of noise-induced hearing loss is industrial noise. Government surveys estimate that up to 20 million people are currently working in conditions which are potentially hazardous to their hearing. Not all are suffering from hearing losses since some people are less susceptible to noise damage than others. Aso, many companies are now providing ear protective devices for their employees although ear protection is considered far less preferable than reducing the noise at the source.

Despite these measures, industrial noise has also been increasing over the last decades, and only very recently has legislation been enacted to curb it. A 1969 amendment to the Walsh-Healey Regulation limits levels of industrial noise to 90 decibels for a full working day. Higher levels of noise are permitted for shorter durations of exposure.

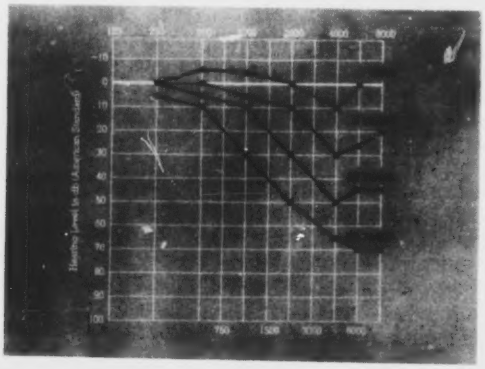
The recent enactment of the Occupational Safety and Health Act extends the Walsh-Healey limits to all companies involved in interstate commerce, so theoretically most workers should be fairly well protected. The truth is, however, that the Labor Department's team of inspectors is very small in comparison to the national need, and there are many companies who hardly know where to begin in order to comply with the Walsh-Healey regulations.

Another shortcoming in the current legislation is the fact that the 90-decibel level is not designed to protect everyone. Some individuals are physiologically as well as psychologically more susceptible to noise. Research has shown that continuous noise as low as 80 decibels can sometimes be harmful. Also, there are large problems posed by intermittent noise which is characteristic of construction noise as well as most kinds of environmental noise.

It is true that the ear can tolerate higher levels of noise if they are interspersed with periods of relative quiet. However, the damaging effects of intermittent noise depend on a number of variables including the amount of relative quiet between noises, the frequency composition of the noise, and the individual's susceptibility. Research in this area is underway but, as you can see, it is a complicated problem.

At this point it might be helpful to describe hearing loss in a little more detail.

Could I have the the next slide, please.



Slide 7. Audiogram showing progression of hearing loss as a function of years of exposure to industrial noise of high intensity. From *Audiology*, 2nd ed., by Hayes A. Newby, N.Y., Copright © 1964 by Meredith Publishing Co. Reprinted by permission of Appleton-Century Crofts.

This is a picture of what we call an audiogram. You will see frequency or pitch along the horizontal axis with the low tones on the left and the high tones on the right. Sound intensity or loudness is represented on the vertical axis and the dots show how much intensity is needed for an individual to just barely hear each particular tone. The different black lines represent the amount of hearing loss typically sustained by a person working in industrial noise of high intensity.

As you can see, the hearing loss is greater in the high tones than in the low tones, even after 20 years of exposure. This type of hearing loss creeps up gradually, often unnoticed, and is particularly handicapping since the individual is still able to hear conversation but has difficulty in understanding it.

Since he still has good hearing in the low tones and some amount in the middle tones, he is able to hear the more powerful vowel sounds but is unable to hear the softer and higher pitched consonants.

Unfortunately for the hard-of-hearing individual, it is the consonants which give the meaning to spoken language. This phenomenon is also true of individuals with old age hearing loss which is referred to as presbycusis. Although presbycusis is usually associated with the normal process of aging, nowadays it is thought that the continual din of our environment is probably a significant contributor.

It is fairly obvious that people who are not in the immediate vicinity of the noise source will not run the same risk of hearing loss as those who are next to it. However, these individuals, as well as those working directly in high noise levels, are susceptible to physiological consequences which are not immediately related to the auditory systems, but which may affect the ear through total body reactions.

Experiments have shown that levels of noise which are not loud enough or continuous enough to produce hearing loss can still cause an involuntary constriction of the peripheral blood vessels. Loud, unexpected sounds can cause a variety of physiological reactions. According to Dr. Samuel Rosen, a noted ear specialist in New York City, sudden loud noises can cause the heart to beat rapidly, the blood vessels to constrict, the pupils to dilate, and spasms to occur in the esophagus and the intestines. These symptoms probably lessen considerably as adaptation to the noise occurs. However, studies have shown that the process of vascular constriction occurs involuntarily whether or not a person has become used to the noise. Since the artery leading to the ear is the smallest artery in the body it is easy to understand how repeated constriction would limit the blood supply to the ear. Lack of proper blood supply over the years could definitely be a contributing factor to old age hearing loss.

The internal auditory artery which leads to the ear is the smallest artery in the body, and it is probably quite apt to suffer from vascular constriction.

Animal experiments also show that noise tends to cause elevated levels of cholesterol in the blood, furthering the tendency toward constricting the blood vessels. Thus, the health of the circulatory system as a whole is at stake, not only that of the ear.

The hardest to quantify, and yet perhaps the most important aspect of noise, is its effect on the quality of life. The interruption of sleep and conversation, the strain at having to shout and listen over the roar of air compressors and the pounding of jackhammers are just isolated examples of the indignities caused by noise. Unnecessary noise seems to be particularly provoking and has been blamed for triggering murder, suicide, and insanity. Less dramatic and probably too common to document are the cases of sudden loss of temper, child abuse, headache, sleeplessness, depression, and irritability caused by the intrusion of noise into our private lives.

The idea that people become adapted to noise is really a myth. As I mentioned previously, the circulatory system does not adapt. Also, studies have shown that people who work in high noise levels during the day are more rather than less susceptible to aggravation from noise after work. The factory worker is more apt to explode at his noisy children than the man who works in a quiet office.

People will often learn to tolerate noise but not to adapt to it. Surveys have shown that a very small number of people who are bothered by noise will actually register complaints. When complaints begin to appear they represent what has been called the "visible tip of the iceberg."

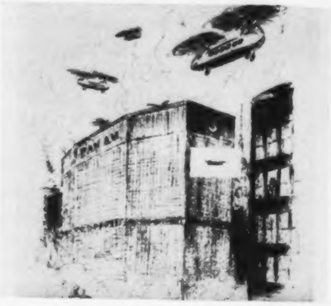
There is no doubt that action is needed, but the problem is what to do.

Can we have the next slide, please.

Slide 8. From "How Today's Noise Hurts Body and Mind", in *Medical World News*, June 13, 1969.

We can always do this. This man is Charles C. Johnson, formerly Administrator of the Environmental Health Service, and now Associate Executive Director of the American Public Health Association. I guess you can see the jackhammers in the background.

Next slide, please.



Slide 9. Drawing by Alan Dunn; © 1966. The New Yorker Magazine, Inc.

It's a little hard to see, but anyway she's saying, "Quiet!" That's a cartoon from the *New Yorker*.

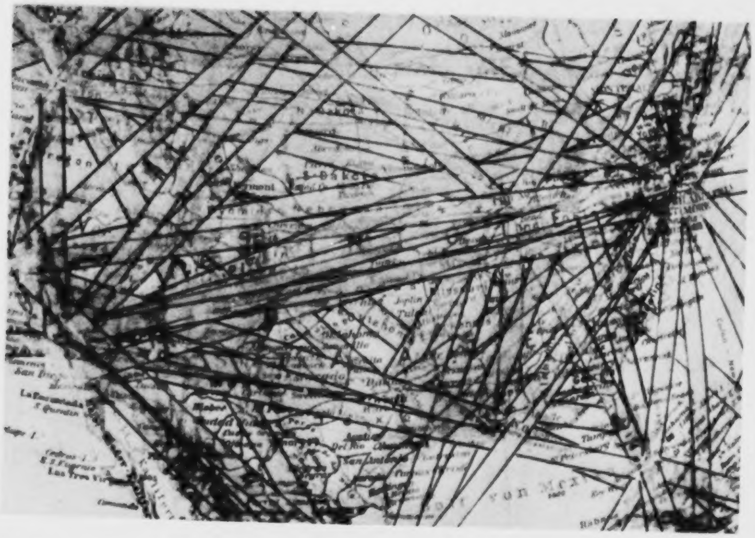
Or we can develop a nationwide effort to convince manufacturers of the need and feasibility of producing quieter machinery.

Ordinarily I don't believe in scare tactics, but I thought I'd leave you with a picture which never fails to make me shudder when I look at it.

Can we have the next slide.

(Slide 10)

This picture shows the extent to which sonic booms would effect the nation if the supersonic transport were to be put into full operation. As you probably know, the SST flies faster than the speed of



Slide 10. Sonic-boom carpets over the United States. From "Acceptable Nominal Sonic Boom Overpressure in SST Operation" by Bo Lundberg, in *Noise as a Public Health Hazard*, ASHA Reports #4, Washington, The American Speech and Hearing Association, 1969.

sound and creates shock waves which follow behind it almost like the wake of a boat. Each of those white lines represents a path from 50 to 100 miles wide—more like 100 miles in that picture—which would receive a sonic boom, perhaps many times a day. As you can see, there are very few parts of the country which would be left unscathed. If we were to allow this to happen we would truly be an impacted nation.

In this paper I have only covered some of the basic problems caused by noise pollution, and I imagine that some of the particular areas will be covered more extensively later. Although the problem is a complicated one, it is not insoluble. Quieter technology, although it may not be cheap, is not just a dream. In fact, to quote Dr. Meyer, noise may be the one instance where knowledge of control techniques exceeds the knowledge about the effects on human life. Perhaps we won't have to go deaf by the year 2000 after all.

DR. MEYER: Thank you Miss Suter. That was an excellent presentation of the general problems of noise and its effect on hearing and as an environmental problem.

I'd like to ask my colleagues on the panel if they have any questions they would like to direct to Miss Suter.

Mr. Baron.

Mr. BARON: On page 2 you said, "Perhaps one reason why noise abatement is a latecomer in the field of ecology is because it is insidious. It causes no pain and little discomfort until it reaches very high levels." I was wondering if you can really make that blanket statement that it causes little discomfort until it reaches very high levels.

Miss Suter: Perhaps I should have said physical discomfort, because it certainly causes psychological discomfort. Is that what you mean?

Mr. Baron: I think it should be clarified. Because you know one of the sources of complaints is air conditioners, neighbors' lawnmowers, and so on. And I don't know. You're not defining "high levels" except you have been using it in the context of hearing loss. Certainly they are sources of discomfort even though they are not high levels.

Miss Suter: Yes. I really meant physical discomfort.

Mr. Baron: Another question was the one about ear protection being considered far less preferable than reducing the noise at the source. I wonder if you would elaborate on that. Because many regulations and approaches to noise control give the noisemaker the alternative in the case of hearing loss of using hearing protection instead of engineering for less noise.

Miss Suter: Well, the Walsh-Healey regulation does say that ear protection should be used only as a last resort. Every effort should be made to quiet the noise at the source. And I hope that's really taken seriously. Ear protection is not a satisfactory remedy. It's not comfortable. It's not always practical. And it's very difficult to convince employees to wear it. In places like textile mills particularly it's terribly hot, and in other industrial situations also.

Mr. Baron: One question in clarification of adaptation on the bottom of page 9. You say, "The symptoms probably lessen considerably as adaptation to the noise occurs. However, studies have shown that the process of vascular constriction would limit the blood supply to the ear." You clarified it I think in an aside. Could you—

Miss Suter: There was a sentence left out.

Mr. Baron: There was a sentence left out?

Miss Suter: Yes. I'm sorry about that. Vascular constriction occurs regardless. People do adapt somewhat to noise psychologically and physiologically both. But the process of vascular constriction occurs anyway, even to fairly low levels of noise.

Mr. Baron: On this business of adaptation, is the only physiological reaction the vascular reaction where you do not adapt? I remember Dr. Gerd Jansen's work, who also worked with Dr. Rosen, and I believe there were a number of physiological reactions for which there was no adaptation. Was it just the vascular? Do you remember that research?

Miss Suter: Yes, I do, but I believe it's animal research, isn't it?

Mr. Baron: No, Dr. Jansen did some work with students in Germany, and so on,—

Miss Suter: Oh, really?

Mr. Baron:—over a period of 3 years.

Miss Suter: I know in animal research they found a number of other physiological reactions that don't cease with adaptation.

Mr. Baron: I think this is a very important point, because one of the arguments sometimes given for permitting noise levels to remain in the environment is this so-called process of "adaptation," and some of the studies would suggest that we are exaggerating the ability to "adapt." I think Dr. Welsh used the expression we become "inured" but our system is still responding. Our conscious awareness might change somewhat but we are paying a price for adaptation.

I just wonder if you could address yourself to that for a moment.

Miss **Suter**: I do know of a few studies that show chemical reactions. Certain chemicals are secreted which ordinarily aren't—in humans—although most of the studies that I know of are animal studies. And I'm a little bit reluctant to generalize from animal studies to humans.

The animals that are used are quite a bit smaller, for one thing, guinea pigs and rats and chinchillas.

And definitely they have found with animal studies that there are many physiological reactions that persist. And probably I suppose you can say it about humans too. I'm not aware of very many studies on humans. Perhaps this is something that needs to be done in the future. But it's also hard.

Mr. **Baron**: Well, don't you tend to generalize from animal studies to humans as far as hearing is concerned? You don't certainly deliberately sacrifice human hearing for the purpose of determining what is happening to the inner ear. Don't you use animals for studies?

Miss **Suter**: That's right, yes. But even so, for instance, if the guinea pig is exposed to 120 decibels of rock and roll music for enough time, the thing dies. And that's not quite true of humans.

Mr. **Baron**: Some people would debate that. (Laughter) They wish they would die I suppose. (Laughter)

But, however, it does suggest that certain physiological changes are taking place. Of course, the degree is different.

Miss **Suter**: The degree is really the difference, yes. And you can generalize in people too. And the slides that I showed you are animal slides. But it's a matter of degree, and I really would hate to say—

Mr. **Baron**: I understand. The only point I'm making is this double standard where as far as hearing loss is concerned we very readily generalize from animal experiments, and then when we come to the non-auditory effects we always make a big point of the fact these are animal experiments.

Miss **Suter**: Well, but I'm also saying that even as far as the auditory system is concerned you can't generalize as to level. You can generalize as to the place of the damage and, you know, the type of damage, but as far as the sound level is concerned it still is hard to generalize.

Mr. **Baron**: Would you care then to clarify the statement on the bottom of page 9? You said there is a missing sentence on this. I just wondered what—

Miss **Suter**: I thought I did.

Mr. **Baron**: Oh, you did?

Miss **Suter**: The process of vascular constriction goes on. In other words, there is no adaptation there. I think that's pretty clear. And then what I meant to say after that was that vascular constriction also limits the blood supply to the ear, and since that artery is the smallest in the body it's particularly vulnerable.

Mr. **Baron**: Also surveys have shown that a very small number of people who are bothered by noise will actually register complaints. I think you have made a very important point there, because if we use complaints it's a complicated thing to determine the impact of noise in the environment. That's one of the reasons.

In other words, you're saying—and this is important for us to understand and remember—that there is not necessarily a relationship between the annoyance or even physiological damage—Apparently a worker in a noisy factory, if I am correct, may be losing his hearing and yet not complain or not be aware.

I'm not going to take time to go into that, but there are a number of reasons why there is that difference in complaints.

Miss **Suter**: Yes. I have heard people say that it's an act of God, that noise is just there and there's nothing you can do, which is really ridiculous.

Mr. **Baron**: That's one reason—the belief it's inevitable as the price of progress, or the fact that it is a lack of manhood or strength or you're neurotic if you complain. I mean there's a body of legends and myths that holds down complaints.

Dr. **Meyer**: Anything else?

Mr. **Baron**: I think, incidentally, if you're familiar with the work in the Soviet Union on the effect of intense noise on workers as far as heartbeats are concerned—

Miss **Suter**: I'm not—

Mr. **Baron**: —Alex Cohen has published that in some of the Public Health papers, and it has showed excessive noise has produced irregularity in heartbeat, which is a very significant physiological reaction.

What I'm trying to do here is raise the issue of the fact that the non-auditory effects of noise are very significant. The research has been more or less meager—a lot more I believe in Europe than here. But it is important to bear in mind that noise does have these effects on the human body which we don't completely understand.

But Dr. Rosen himself believes we will some day determine a noise syndrome, an actual pathological happening in the human organism, from receiving noise of below hearing-loss levels.

And, of course, there is the work—Do you care to say anything about the work that is being done in noise and sleep loss, for example, change in sleep cycles?

Miss **Suter**: Well, I don't really know very much about that. I know that at the Stanford Research Institute I think they are doing that kind of research, and definitely noise does affect the sleep cycle even though the person doesn't wake up. It changes the sleep pattern.

I think that there can be definite bad effects from that even though the person it totally unaware of it. For instance, if the REM state is disturbed many times over, you know, that can have a very bad effect on a person's psychological state.

Mr. **Baron**: I think this is a very important point, because many people near highways or in urban areas think they have a great night's sleep and actually from the results that have come out in some of the sleep studies we know that the sleep cycles are disturbed with consequences that may be much more significant than we realize at this time. You indicated already that there is some concern over this.

Thank you.

Dr. **Meyer**: Before going to Dr. Bender in turn here, I would like to follow up on one point Mr. Baron raised. Would you venture a comment regarding the possibility that some of the so-called adaptation to the actual noise, or rather the lack of response to noise as an environmental insult, is really due to the fact that people have lost their hearing in addition to the presbycusis effect and that the reason noise does not annoy them is because they are not actually hearing some of the higher frequency noises?

Miss SUTER: I rather doubt it, because it almost has the reverse effect. People who tend to lose high frequency hearing sometimes become even more sensitive. And noise usually is broad enough in spectrum that, you know, it affects them anyway.

Dr. MEYER: Thank you.

Dr. Bender.

Dr. BENDER: I have no questions.

Dr. MEYER: Dr. Lyons.

Dr. LYONS: I'd like to address the fact of what constitutes what we understand or what we accept as a noise safety hazard and what we just guess might be a noise safety hazard. The evidence is fairly well documented and accepted I think by most scientific and layman communities that high noise levels such as 90 dB(A) or such under long-term exposure will cause hearing damage, as you showed in the slides. What is the level at which hearing damage would not be expected even under long-term noise exposure?

Miss SUTER: A very difficult question. I don't think that's known. People can estimate it. But you mean for continuous noise? You see, the problems of intermittency just make it so difficult.

Environmental noise is never just continuous. It's always intermittent. And it involves I mean a mathematical wizard really to figure out during the average day, you know, how much environmental noise is at what level, what the ambient is, and what the additional levels are. And you could probably come up with a total for a day, but everybody's total is different.

Dr. LYONS: Right. But hasn't it been fairly well accepted that continuous noise exposure of approximately 80 decibels, "A" scale weighted, would not cause hearing damage in a significant percentage of the population?

Miss SUTER: Yes.

Dr. LYONS: That is, continuous exposure, 8 hours a day, 5 days a week, 52 weeks a year.

Miss SUTER: Yes. We hope.

Dr. LYONS: And extrapolating that on, isn't it also fairly well accepted that noise levels occurring intermittently, say once a day for a few minutes, of 120 decibels, "A" scale weighted, or so, will similarly not cause inner ear hearing damage?

Miss SUTER: We don't know. Just because you don't have a hearing loss or a temporary threshold shift afterwards doesn't mean that there isn't damage caused. And I think I brought this out in the paper—that there have been studies—animal studies again—that show these animals have been exposed to high levels of noise and then they do have a temporary hearing loss which returns to normal. Later on when the ear is sectioned and examined they are missing hair cells. We are probably doing that too, but we just can't tell.

Dr. LYONS: You have addressed the point that I wanted to make—that there is scientific evidence that is fairly well accepted, you know, that documents that inner ear hearing damage occurs when people are exposed to excessively high noise levels. When these noise levels drop below a certain level such as approximately 80 dB(A) continuous exposure or 120 dB(A) for short-term exposures, the evidence becomes very sketchy and the scientific community does not agree that there is a correlation between physiological damage and these lower noise-level exposures. Is that not—

Miss SUTER: I think a few years ago that's what people thought, that once you got down to 80 decibels you're safe and sound, and if you only had a few exposures to very loud levels per day you are still safe and sound.

Nowadays they really don't think so, because the evidence has shown that there is cell damage even though you seem to hear fine.

And so really the implications of this are that by the time a person is eligible for presbycusis, old age hearing loss, they are much more susceptible. Now, it can be a combination of cell damage that you don't know about when it's going on, and it can also be the effect of vaso-constriction caused by lower levels of noise, and all these other physiological effects, wear and tear on the systems.

Presbycusis is a very kind of an amorphous thing. It's really a mixed bag. Some people say it's just "getting old." Other people say it's very possibly caused by lower levels of noise when the person is younger. Other people think that it's due to cardiovascular problems. And it could be that the whole thing, the interrelation, the noise, the age, and the cardiovascular problems, all probably lead to presbycusis.

So when you say somebody is safe and sound at 80 decibels, we really don't know, and the chances are they are not.

Dr. LYONS: I have no further questions.

Dr. MEYER: All right. Mr. McCarthy.

Mr. MCCARTHY: I was intrigued by the suggestion on page 5, where you are talking about some of the harmful effects on hearing. After that experiment done with the animals who are exposed to sudden noises or loud noises and apparently the hearing was restored after a short time, and yet in fact it was discovered that hearing loss did occur or that loss of cells occurred, you just sort of leave us wondering if temporary loss of hearing, you know, is something that shouldn't be looked into a little farther.

I think from all of what I have heard so far it is a reasonably significant question to ask, and I just wonder if you can enlighten me and the other panel members for a moment if you know of anyone who is seriously looking into this question.

Miss SUTER: They are doing studies on temporary threshold shift in a number of places—Central Institute for the Deaf, the Kresge Research Laboratory, Dixon Ward up in Minnesota. I'm most familiar with the ones at Central Institute for the Deaf—Miller and Eldridge I believe.

They are the ones who are reluctant now to induce temporary threshold shifts on people because of this very reason. They are afraid that it is causing cell damage even though the person's hearing has returned to normal. It has been popular to do temporary threshold shift experiments on college students, and I know lots of places where they do it. And I think people are beginning to frown on that.

Mr. MCCARTHY: The results seem to indicate though—at least I gather the preliminary results—that hearing loss or damage is induced. And I guess my only point is that if this is really true it seems to be a rather significant effect of temporary sources of noise—

Miss **Suter**: Well,—

Mr. **McCarthy**: —producing permanent effects.

Miss **Suter**: —yes, I think at this point they say that there is a risk, a very definite risk, and therefore that's why they'd rather not use human subjects to do it any more. Previously they thought that it produced fatigue in the inner ear and then hearing returned to normal. Now they are not so sure if it's just fatigue.

Mr. **McCarthy**: Thank you.

Dr. **Meyer**: Dr. Okun.

Dr. **Okun**: You have discussed at quite some length some of the effects, and I presume that you have given some thought to the manner or form of control. Within industry perhaps it's a little easier. But with regard to community noises that are the responsibility of a very diverse population, have you given any thought to the kind of regulations that would be appropriate, the kinds of legislation that might be needed?

Miss **Suter**: I haven't.

Dr. **Meyer**: Thank you very much, Miss Suter, for a very thorough stage-setting for the discussions of the rest of the day. I thought it very important, if we are going to talk about noise and noise control, that we have such a presentation. We appreciate the tremendous amount of time that you put into this. I would appreciate it if you could furnish me copies of the visual material so that we may include it in the printed version of the record.

Dr. **Meyer**: I am sure that people would like to talk to you later on at the break. We appreciate your help very much.

Having heard about the effects of noise on the human mechanism, we will now proceed to discuss some of the things that can be done about this problem. Our next participant in these discussions is Mr. Earl Ellwood of the United States Gypsum Company. Mr. Ellwood, we are happy to have you with us and look forward to hearing from you regarding the subject at hand.

STATEMENT OF EARL ELLWOOD, UNITED STATES GYPSUM COMPANY

Mr. **Ellwood**: The paper which I am about to present was prepared by Mr. Joe Newman, Vice President of Tishman Research Corporation, which is a subsidiary of Tishman Realty and Construction Company of New York City. Joe is in Europe evaluating some industrial concepts for my company, so he felt that I could probably represent him in his absence.

The title of his paper is "Noise Control. Sound Emanating within Office and Similar Type Buildings."

The problem of achieving a good acoustical environment in commercial and institutional buildings is a complex one and the objective of this brief paper is to place the problem in proper perspective, indicate a satisfactory solution based upon experience, and to suggest what to do and not to do.

The extent and nature of the problem is not quite clear and highly subjective. The number of complaints emanate from a very small percentage of the total occupants in office buildings. Those who complain are the most vocal, but more importantly, as with most subjective considerations, it is almost impossible to satisfy all concerned.

To minimize problems and achieve an acoustical environment satisfactory to a high percentage of the population, one must call upon the combined expertise of the engineering and architectural disciplines and the practitioners who build the systems, subsystems, and components. Acoustical engineering cannot be treated solely as an exercise in design, but must include and have the support of the aforementioned teammates working together from the outset. To achieve predetermined objectives, building owners, general contractors, subcontractors, trade mechanics, and a variety of professionals must be thoroughly trained, motivated, and coordinated.

Unfortunately, the details which may be required to provide a good acoustical environment may not always be compatible with the details required for fire safety, architectural aesthetics, and economy.

You concentrate on establishing the best balance or compromise between cost and function, all factors considered, seeking the best solution for the least money.

Now I would like to briefly tell you about some of the considerations and factors that make the noise control complex and then about an approach that my company follows that permits us to offer effective privacy for a relatively low additional cost.

1. Initially, the degree of privacy required for occupancy of the various tenants must be intelligently established. Obviously, the privacy required for a medical suite will be more critical than the privacy required in a commercial business occupancy.

2. A knowledge of noise levels anticipated in the various occupancies is another important consideration.

3. The location of the structure has a bearing because of the masking level of background noise. Acoustical isolation of occupancies is more difficult in quiet, isolated locations than in a busy metropolitan location.

4. Acoustical properties of an occupied space is another consideration. Properly analyzed and designed, acoustical absorption within an occupancy will reduce the sound pressure levels.

5. Limitations of the structure is another very important factor.

(a) One of our major suppliers of building materials has established that structural flanking paths limit the degree of privacy. A wood frame structure has a limitation of approximately 45 STC. The installation of a 54 STC partition in a conventional wood frame building is an exercise in futility, for unless the structure is decoupled, the isolation achieved will still be approximately 45 STC.

(b) Air distribution and return ducts are another common flanking path unless properly designed and installed.

(c) Piping and electrical conduit can be flanking paths, but more often their installation shorten out decoupled assemblies.

(d) Vibration from mechanical equipment is another source of unwanted sound.

6. Architectural layout within the space is a further consideration. Unfortunately, through the leasing of space, with individual tenants retaining other architectural firms or interior designers or calling the shots themselves, control of the layout within the building is often lost.

Architectural layout should consider like occupancy to like occupancy. It is conceivable that a noisy machine room of one tenant may end up adjacent to the private office of an executive in another tenant's space.

Within occupancies, and especially in corridors, the placement of doors is important to retain privacy.

7. The selection of systems for partitions and floor-ceilings may appear to be a simple matter, since most manufacturers have provided the industry with a great deal of technical data related to sound control. However, I would like to question this simplicity and raise a few points of caution:

(a) Most manufacturers reliably publish technical data obtained through testing assemblies in what we call classical laboratory facilities. The published data is at best a first approximation only, since a classical laboratory facility provides you only a comparison from one assembly to another assembly under ideal and controlled conditions. You cannot always expect to achieve comparable results in the field, but you can expect to obtain a similar relationship. The assembly testing best in a laboratory, when properly installed, should provide the best result in the field.

(b) You have to assume that the manufacturer has competent engineers erecting the test panel and all the components; the erection procedures and details are used to assure the highest number rating possible. This is obviously a good marketing procedure. Copies of the actual reported tests should be obtained for evaluation by a competent acoustical enginneer who can detect differences between laboratory and real life practices.

(c) You cannot assume an assembly promoted by one manufacturer will achieve comparable results when erected by components from another manufacturer. The physical properties of a metal stud may not be identical due to the metal gauge or configuration. The acoustical absorption of a sound attenuation blanket may vary due to density or other physical properties. The gypsum wallboard may vary due to physical properties not immediately apparent. Allowing the subcontractor the latitude of substitution based on purchasing advantages after bidding according to plans and specifications is a good method of compromising your results. However, pretested combinations of different manufacturers' products can overcome this compromise. This is not done too often, however.

(c) In the selection of assemblies, which are used to divide and finish space, the elements should be reasonably comparable in resistance to sound transmission. The up-and-over sound transmission loss of a ceiling assembly should be in the same range as the partition, for like a chain, the result is no better than the weakest link. If the up-and-over STC of a ceiling assembly is 40, based on a laboratory test, the partition should be selected that has a 40 or 41 STC rating. But here again, the ceiling test must be evaluated by an acoustical engineer, for the depth of the plenum space, the composition of elements in the plenum, all have a bearing on field performance.

8. Once it is decided what is to be done, it is necessary to translate this through architectural detailing and specifications. This is not always easy because it must be remembered that sound isolation is based on three physical properties—mass, isolation or decoupling, and damping— but not any one of these three is effective if leaks are

provided in the assembly. Every minute hole and crack must be sealed, and the sealing or caulking must be resilient and elastic to compensate for movement in the structure.

9. Field supervision of all installations must be provided by competent personnel. In field testing undertaken by one of our suppliers, it was illustrated that sound-rated partitions, installed with no attention to acoustical detailing, provided a field performance of 10 to 20 STC points below the laboratory rating. However, with good architectural detailing and good supervision, the partitions provided field results comparable to or slightly below the (3 to 5 STC points) laboratory results.

We find that the most inexpensive way of obtaining the intended results is to use a non-hardening sealant or caulking material under all runners—floor and ceiling—to seal the runners to the structure. Without such acoustical sealing, we cannot approach the desired sound privacy predicted upon laboratory tests.

Also, we find that placing sound attenuation blankets in the cavities of partitions, in accordance with the manufacturer's recommendations, allows us to use the most economical wall system.

Also, we make certain that cutouts and openings are properly sealed or stuffed with appropriate sound isolation materials. Where higher levels of privacy are required, partitions should run from the floor to the underside of the ceiling slab.

All these things permit one to come reasonably close to laboratory results. However, it should be clearly understood that it is almost impossible to achieve laboratory results in the field. The objective is to come closer to such results than what would otherwise be possible

RECOMMENDATIONS

1. Be extremely cautious in the use of Minimum Property Standards established by setting sound transmission classification (STC) objectives to elements of a building for the following reasons:

(a) It establishes sound control as a numbers game. What is the effective difference in sound isolation between two partitions with respective laboratory ratings of 50 STC and 49 STC, when 1 dB can be described as the amount of noise a small mouse would make urinating on a blotter?

(b) Established standards for selection of systems based upon laboratory testing will not improve the acoustical environment with no identification or control of the architectural detailing or workmanship.

(c) The standards established may be completely adequate for one location and/or building type and inadequate for another.

Use ranges and guidelines instead.

2. Provide cogent data and an educational program to show that good acoustical environments can be achieved by paying attention to the kinds of things discussed herein. This means educating the public and government agencies on the importance of the team approach and the utilization of responsible builders and engineers.

3. Encourage the use of cost-benefit analysis for alternate solutions to acoustical problems and an involvement of all parties from the outset.

4. Emphasize combinations of things that should be done, and in particular, the elimination of all flanking paths by use of effective

acoustical sealants and sound attenuation blanket in all cavities, and proper workmanship during installation.

Dr. **Meyer**: Thank you very much, Mr. Ellwood. We are presented with a minor technical acoustical problem for the members of the panel and witnesses or participants. I understand some of the people in the back of the room are having a little difficulty hearing so would everybody be sure to speak a little closer to the microphone or else a little louder. I'll reverse the alphabetical arder and ask Dr. Okun if he has any questions.

Dr. **Okun**: This is just a question of general interest in connection with multifamily housing units or office or industrial buildings. How is the prospective tenant to assess the quality of the acoustical protection that he is likely to get in a building? Beacause the building is long since built and he is coming in, and it's only after occupying that he generally finds out that he has made a serious mistake and there are problems.

Is there any way of assuring a level of acoustical protection?

Mr. **Ellwood**: I would say that if I were going to buy or rent an expensive apartment in a high-rise building I would probably, before making a commitment, obtain the services of some local acoustical engineer to evaluate the construction, which he could do for a fee of two or three hundred dollars.

Dr. **Okun**: This is a fairly expensive operation for every prospective home owner. Isn't there something that might be done by either builders or by regulation that might certify or at least establish an acoustical rating for these multifamily structures, office buildings, or other places that are used by the public generally?

Mr. **Ellwood**: Well, for example in San Francisco some of the major builders in that market have established a specific STC rating for their partition constructions. Prior to the installation of any of these partitions, the initial partition is erected supervised by an acoustical engineer, and it's tested. If the partition comes up to the established rating, then the subcontractor is allowed to go ahead and build these partitions as he built this one.

At some point in the building the acoustical engineer comes back in and then checks to make sure that the subsequent partitions have been built in accordance with the ratings achieved in the first one. If the rating comes up, the contractor is allowed to go on. If not, he then has to go back and make a correction to that partition and go back and correct all other partitions which have been built.

As a result they are getting a pretty good level of sound isolation in their partitions.

Unfortunately, it's difficult for a builder to know what sound levels are going to be achieved in some places. In Chicago I have some friends who have moved in from the suburbs where they have had other hobbies, and they moved into a high-rise apartment house. And because they have got a lot of spare time on their hands, they then bought one hell of a big Hammond organ. And not being a musician, he does a lot of practicing. And as a result, everybody else on that floor and above him and below him are unhappy. I don't think you can expect a builder to anticipate that type of consideration.

Dr. **Okun**: Do the builders who use this approach in San Francisco advise prospective clients either through their advertisements or promotional material of the acoustical levels involved?

Mr. Ellwood: Unfortunately, some of them advertise them as being soundproof, and, of course, you know as well as I know that there is no such thing as a soundproof structure.

Dr. Okun: Are there any sets of regulations that might be established to provide a guide for proper promotion of various acoustical levels of protection?

Mr. Ellwood: I would guess that you could probably establish a set of standards, but the set of standards would have to be established at the end point of the construction and not from the standpoint of design, which would mean after the partitions were built they should be tested to determine whether they come up to the rating.

Dr. Okun: Thank you.

Dr. Meyer: Mr. McCarthy.

Mr. McCarthy: Could you elaborate on that last statement just a moment? I'm not quite sure I understood.

Mr. Ellwood: For example, today we have a set of FHA standards, and the standards say the partition dividing a corridor in an apartment, for example, may have to be 50 STC. If that builder selects from a manufacturer's literature a partition which has had an acoustical rating of 50 STC, his plans are approved. When the building gets built, that system may have been bastardized by the subcontractor and he may be getting a rating of 30 or 35, not the 50, so the FHA standards are not very effective.

Mr. McCarthy: Well, what do you do in that case when they don't come up to standards? You're saying the standards are not very effective. And if I read one of your recommendations right, I think you're calling for a range of values rather than a fixed number.

Mr. Ellwood: That's right.

Mr. McCarthy: I mean does this range go to that degree—30 percent?

Mr. Ellwood: I would say that probably one of the most effective ways of getting good sound control is tenant occupancy. If you're unhappy, you move out. And if the building is unoccupied, then the fellow is going to do something about bringing up the standards.

Mr. McCarthy: That could be a tricky experiment for the people involved, the tenants.

Thank you.

Mr. Ellwood: I think that's probably why people in this country would prefer to live in a single-family house rather than a multifamily home.

Dr. Meyer: Dr. Lyons.

Dr. Lyons: Do you have at the tip of your tongue some estimates of what it costs to modify an existing structure to add a substantial amount of quieting?

Mr. Ellwood: Yes. It is goddam expensive. I can give you a couple of examples.

There was a pretty fair structure built in St. Louis, and some place along in the design they had a kitchen with a garbage disposal unit in the sink, and that kitchen backed up against the bedroom of another tenant occupancy. And every time somebody threw a bone in that garbage disposal, the guy who was sleeping went through the ceiling.

It would probably cost a maximum of twenty dollars per lineal foot what the original partition cost to go in and correct that. Any time you have to go back in and add a correction to it, you are eliminating space, you are working in finished occupancy, and your cost goes up fantastically.

Dr. **Lyons**: No other questions.

Dr. **Meyer**: Dr. Bender.

Dr. **Bender**: I'd like to pursue that a bit if we may. You say that corrective action costs about 20 times more than the original construction,—

Mr. **Ellwood**: That's right.

Dr. **Bender**: —which to my way of thinking implies that to do it right from the beginning would have been pretty cheap.

Mr. **Ellwood**: That's right. In the first place, you never should design an apartment with a kitchen adjacent to a bedroom of another apartment. It should be kitchen to kitchen and bedroom to bedroom in layouts.

Dr. **Bender**: Another question. On page 8 you comment that you would encourage the use of cost-benefit analysis for alternate solutions to acoustical problems and an involvement of all parties from the outset. Now, isn't it true that the costs are borne largely by the contractor, building owner, who passes them on to the tenants of course, and the benefits are provided to the occupants, and that really the occupants have no practical way of finding out how quiet their environment is going to be before they move in?

I think the notion of hiring an acoustical consultant, while that may work—if you hire one he may tell you what it's going to be like—I haven't known of anybody to do that. Very few people can afford a couple hundred bucks to find out how quiet something is.

Mr. **Ellwood**: I think probably that a simple solution would be if you were going to rent a piece of property to put somebody on one side of the partition and talk in a loud tone of voice and stand on the other side and determine whether you can hear him or not.

Dr. **Bender**: But if the other side is occupied—

Mr. **Ellwood**: There are certain elementary ways of accomplishing that.

Dr. **Bender**: Well, even that seems to me to have a lot of difficulties. If the other side happens to be occupied, the people living there might not like the idea of their new neighbors walking in and shouting through the walls.

Don't you really think— Well, let me ask you this question. You mentioned that standards are not terribly relevant, but is that an insurmountable problem to make standards more relevant to construction? And don't you think that legislation is perhaps a viable way of achieving privacy especially in multifamily dwellings?

Mr. **Ellwood**: Well, they have had standards in Europe for a great many years, and they have a type of construction over there which lends itself to a pretty good acoustical isolation, being largely in the neighborhood of heavy masonry.

But in my experience in Europe I find that they have the same problems of flanking paths and leaks that we have in this country due to poor construction practices. And the standards, while they may be there, apparently are not adquately enforced.

I have no quarrel with standards except that I think the standards have to be intelligently set. We find, for example, that some lending agencies and Federal agencies have established some standards which in effect are kind of ridiculous. In other words, you set a standard for a partition within an occupancy to establish what the STC rating of my bedroom wall shall be within my own occupancy, which is kind of a ridiculous situation because if I can't control a sound in my own living quarters I'm always going to have a problem. And particularly when you allow a flush hollow-core door to be put in which will have an isolation of 10 or 15 STC, why should a standard be established for 36 on a partition in that case?

Dr. **Bender**: You mean to say you don't think there should be any standards for the attenuation of walls between recreational and, say, sleep areas within a person's own home?

Mr. **Ellwood**: No, not within my own area. But I do think it should be controlled between occupancies and perhaps between corridors and occupancy, but there again on a corridor if you establish a rating for a corridor of 50 or 54 STC, what type of a door arrangement can you put in that will come anywhere near achieving what you are requiring of the partition? If you get 20 STC on that door you're going to be lucky. You've got to get into the apartment.

Dr. **Bender**: No more questions.

Dr. **Meyer**: Mr. Baron.

Mr. **Baron**: I'm not quite clear on something. That is, are we talking about relative perfection? Because I compare an apartment which is put up without any restrictions whatsoever and it is pretty hideous. And you're talking about having a leak that some high frequency sound can go through.

Question No. 1, could you concretize, could you give me a description of a leak we'll say where a high frequency sound goes through and, if you could, give me a practical example of where this causes a serious problem?

Mr. **Ellwood**: I can give you 20 or 30 examples.

Mr. **Baron**: I'll take one.

Mr. **Ellwood**: You build an apartment and you put a medicine cabinet in two bathrooms back to back, and you have two pieces of metal between them.

Mr. **Baron**: I understand that. That isn't what I'm talking about.

Mr. **Ellwood**: That's one leak.

Mr. **Baron**: That isn't what what I mean.

Mr. **Ellwood**: Okay.

Mr. **Baron**: You talked about a leak, we'll say, small leak in a partition—

Mr. **Ellwood**: All right.

Mr. **Baron**:—where high frequency sound can go through.

Mr. **Ellwood**: Suppose you build a flat-plate, reinforced-concrete high-rise and you have got continuous creep deflection and your floors sag. And as the floors sag your partition now becomes loaded and it cracks, and you get a crack an eighth of an inch wide at the bottom and it may come up to be practically infinitesimal at the top. That's a sufficient leak to allow sound to violate the effectiveness of your wall.

You've got electrical outlets back to back. You've got TV outlets back to back. You've got a closure plate between a column and a window wall.

Another flanking path would be similar to one that is in a northern university in which they have a fine arts building in which the walls between the music rooms are 12 inches of reinforced concrete. They have sound locks with riverbank doors. But for aesthetic reasons the architect put a curtain wall on the exterior of that building. A student can play the piano in one corner room, and down the building five or six rooms further down with four or five massive concrete walls between them a professor can write the music on the chalkboard that that fellow plays on the piano because of the flexing characteristics of the curtain wall.

Those are all flanking paths or leaks.

Mr. **Baron**: Right. But these it seems to me with proper understanding on the part of all parties—you make this point, or Newman did—would have prevented this, as you say.

Mr. **Ellwood**: It could be. That's right.

Mr. **Baron**: But the impression sometimes is created that it's almost impossible to design a proper acoustical environment because of a tiny leak, and the image that usually comes to my mind is a pinhole or something.

Mr. **Ellwood**: We're not talking about pinholes.

Mr. **Baron**: You're talking about flanking. But this can be taken care of in the installation.

Mr. **Ellwood**: It can be taken care of in the design and construction, and it always costs a little more money to do it.

Mr. **Baron**: On the question of cost-benefit, this is an EPA hearing—on the environment—and I hope that when you are talking about cost-benefit that the new interpretation of cost, which is the externalizing, the forcing of costs on the person who is receiving the noise, is understood to be part of the cost. We no longer should be thinking of straight dollar cost of design.

Some day we are going to find out I think we are paying a terrible cost for having put up a lot of these post-war homes where privacy does not exist. And I would like to point out that it is not easy to move and that tenancy movement in an area where you have a tight housing situation, such as you have in New York and perhaps other cities—movement of tenants because of unhappiness with the acoustin environment—is not easily done.

And one of the things I think that we are going to have to address ourselves to and I'd like your thinking on it—you brought up one aspect of it—is some way of retrofitting postwar apartments so they can become literally habitable as far as the acoustic environment is concerned. I think we have a very serious problem there.

If you tell somebody to move or use moving as an index, right now it is not a very appropriate index.

Mr. **Ellwood**: I would like nothing better than to have the opportunity to sit down with a builder and an architect prior to his design and show him how to do the job right, because it always involves more of our materials, which increases our sales, which increases our profits.

Mr. **Baron**: How do you propose then this educational program or this— You mentioned in Europe, one, because of the materials they use and also because they have been working on this business of building codes since the 1930's in some countries— I don't want to go into the question of enforcement, but we do know Europeans in many countries have been using or having available building codes for acoustic attenuation. What do you propose that we do here in a system of steps when we put up, say, multifamily dwellings, which are going to become as our population increases very important aspects of our living situation?

Mr. Ellwood: Well, the most successful solution I have seen to that is the establishing first of intelligent standards, and that is recognizing the fact that door openings off corridors are going to be weak so that you don't put an excessive amount of money into a corridor partition because in the corridor your noise is always intermittent. You haven't got a continuous noise level in a corridor like you have in another occupancy.

But if you establish intelligent standards and then establish the fact that this is a requirement of the completed wall and not the design wall, and then establish some method of checking that before the occupancy is allowed to take place, then I think you could establish a reasonably good standard of environment for living.

Mr. Baron: If I understand you correctly, you are saying there should be two things. One is—

Mr. Ellwood: Intelligent standards.

Mr. Baron: —a standard of the materials,—

Mr. Ellwood: That's right.

Mr. Baron: —and a performance standard after the materials are assembled?

Mr. Ellwood: That's right.

Mr. Baron: That you really need both?

Mr. Ellwood: That's right.

Mr. Baron: The Dutch have been doing a lot of that in field testing, haven't they?

Mr. Ellwood: Yes.

Mr. Baron: You're talking really about materials testing and field testing after assembly?

Mr. Ellwood: That's right.

Mr. Baron: Just one last question. Do you believe that it will ever be possible to work out some less than 20 times system for retrofitting some of the horrible apartment situations we have now?

Mr. Elwood: Well, I guess that would depend on the degree of problem that exists. There is always an opportunity to build a wall alongside of a wall which may cut down the occupant's space. But there are also other methods of decoupling and damping which may provide reasonably good solutions.

But the problem when you go into finished material is the problem of getting materials in there. You have to take off trim. You have to extend outlet boxes. You just involve every trade which is used in the structure when you get involved in this, and you have got a problem of coordination, and it is a costly operation.

Mr. Baron: Would you say that we need some research in possible ways of—

Mr. Ellwood: I don't think there is any research needed. I think we are all well enough aware of what the problems are.

Mr. Baron: In terms of retrofitting?

Mr. Ellwood: No, I don't think so.

Mr. Baron: Just application?

Mr. Ellwood: I can take and renovate any building so it's satisfactory. I don't need—

Mr. Baron: At a 20 times—

Mr. Ellwood: That depends upon what the problems are.

Dr. Bender: Just one brief comment concerning research. The example that you gave had to do with a garbage disposal. Now, a possible alternative instead of rebuilding the apartment would be to redesign the garbage disposal.

Mr. Ellwood: Could be.

Dr. Bender: Now, currently I doubt if there is enough known about how garbage disposals generate and transmit noise in a quantitative way, but perhaps that would be a useful area for research.

Mr. Ellwood: Although I would doubt that anything you do with that garbage disposal unit would satisfactorily resolve the sound problem on the opposite side. There are just a lot of stupid things that are done continually.

For example, every time that anybody builds an apartment they always put their TV outlet on the party wall, don't they? So you have got a TV backed up on each side. What is the noise level at the back of your TV? 90 dB. If you get a 50dB wall, you have got 40 dB coming through. So you don't even have to turn on your set on the other side if you want to hear the program except you can't see the picture.

If you move the outlet to the non-party wall, if you move the set so it's 25 or 30 or 15 feet away, you dissipate a great deal of that energy before it gets there.

Dr. Meyer: Well, if the Chair might interpose a summary thought before moving on here, it seems to me that one of the underlying things that is being said is, as you have pointed out or as Mr. Newman pointed out in his paper, is the need for some real educational activity.

Mr. Ellwood: That's right.

Dr. Meyer: I'm glad we have members of the academic community with us on the panel, because in addition to education of the public it seems as if we have got to focus greater attention on these sorts of environmental amenities and requirements in the training of architects and engineers as part of their basic education.

Mr. Ellwood: As far as I know, today there are two schools of acoustics, M.I.T. and Penn State. Am I right, Mr. Bender?

Dr. Bender: Yes.

Mr. Ellwood: I think those are the only two. Any course which is given at the architectural schools across the country is very, very elementary and almost subservient to design and rendering.

Dr. Meyer: Well, thank you very much, sir. This has been a stimulating discussion, and we appreciate your comments. I'd like to move on now to another phase. We have got a fairly long day, and we are interested in hearing about noise in actual construction. We have heard now about noise inside a structure. Mr. Frank H. Walk, a professional engineer of the firm of Walk, Haydel & Associates, New Orleans, Louisiana, will now give us a presentation about noise associated with construction.

Glad to have you with us, sir.

STATEMENT OF FRANK H. WALK, PROFESSIONAL ENGINEER, WALK, HAYDEL & ASSOCIATES, INC., NEW ORLEANS, LOUISIANA

Mr. Walk: Thank you.

Mr. Chairman, distinguished members of the panel, ladies and gentlemen in the audience, our company specializes in the design and construction management of industrial plants. We are not construction contractors. Rather, we are construction managers. Most of our experience has been in the southern part of the United States and has included plants for petroleum refining, petrochemicals manufacture, food processing, pulp and paper manufacture, cement manufacture, metals processing and fabricating, and others.

My comments are based on some 30 years of experience, with our present company and elsewhere, in the design and construction of industrial plant facilities.

My discussion will be more general than technical, leaving to others in our organization or elsewhere the coverage of measuring noise in terms of sones, phones, Hertz units, decibels, etc.

Although a fair amount of what I will say could be applied to construction in general, my remarks are pointed specifically to industrial plant construction.

Before discussing noise in construction, it seems appropriate to review briefly for comparison purposes the attitudes and progress of industrial plant owners towards the reduction of noise pollution in the operation of their manufacturing and processing facilities. This is as we see it.

Our experience indicates that most plant owners are quite interested in having effective noise control in their respective industries. Outside of the strictly humane and legal aspects they are well aware of the advantages to be gained in better employee relations, improved communications, less employee tension, higher production levels, and reduced error factor, all of which can be realized to more or less degree through a good noise reduction program.

Much progress has been made in the isolation and reduction of objectionable plant operating noise. Through study and research, effective technology has been developed and largely proven so that reduction in noise levels for most manufacturing equipment and operations can now be achieved at a reasonable cost if emphasis is placed on this criteria prior to, and during, the design and construction phases.

The higher costs and relative ineffectiveness in some cases of reducing noise levels in an existing industrial plant have been documented. For the most part the lessons learned are now being applied to future plant design through the imposing by plant owners of maximum noise level specifications for industrial plant equipment and processes.

From our observations there has been far less progress toward noise abatement in the construction industry serving industrial plant owners.

It is true that the wide variety of conditions confronting the industrial plant constructor in many different geographical locations and plant types results not only in a variety of noise intensities, time patterns and frequencies, but also in a considerable variety of noise abatement requirements imposed through legislation, social pressures, and other factors. However, it is also true that the average industrial plant construction contractor has been subjected to much less noise abatement pressure (or incentive) than has the average industrial plant operator.

This is due at least to some extent to the fact that the construction operation and its associated noises is of a temporary nature and better to be tolerated than is the long-term, permanent type manufacturing operation which moves in to use the facilities when the constructor moves out, as contrasted with additions to existing plants.

The majority of the new plant construction, at least in our general area of activity, takes place in relatively undeveloped rural locations. While residents or service businesses sometimes move in around the plant later, they are not present to be annoyed by construction phase noises.

Due to the open-air surroundings existing for most phases of an industrial plant construction project, especially in the mild climates of the Southern United States, the construction workers themselves are subjected to less noise exposure and fatigue than they might be under different conditions.

The fact remains that equipment and operations currently used in the construction of industrial plants do produce noise, a good portion of which must be classified as objectionable when measured by the criteria generally used by industrial plant owners in evaluating their own manufacturing operations. Draglines, bulldozers, and pile drivers used in grading, excavating, and foundation installation operations are practically always a source of noise nuisance. Portable steam boilers and air compressors required in heavy construction usually produce objectionable noise. "Headache" balls and jackhammers used in pre-construction demolition work cause excessive noise and vibration. Welding machines, pneumatic hammers, power saws, pneumatic wrenches, drills, reamers, concrete mixers, dump trucks, etc., all produce noise, some of which would be classified as objectionable depending on conditions.

Most industrial plant construction contractors have substantial firms with excellent management who, given the proper incentives, we feel will be quick to recognize the advantages of a good noise control program. Just as their manufacturing industry counterparts have already done to large extent, they will be easily convinced of the better public relations, better employee relations, improved communications, reduced employee tension, higher work production levels, reduced error factor, and lowered legal risks involved in a well planned and executed noise pollution abatement program.

With a few exceptions, we believe that in general adequate basic technology already exists to effectively implement a program to reduce construction equipment noises to acceptable levels. This basic technology has been developed and checked out to large extent in other industries. Some additional development and engineering effort will be required to economically and effectively adapt certain present technology to analogous applications in construction industry equipment and operations.

Pile drivers generally require steam or compressed air for lifting or forcing the hammer. There are many noise generators associated with this type of operation. Most prominent is the intermittent blow of the pile hammer. Although the sound is of short duration, it is literally an ear-splitting experience. And yet I have known or heard of no pile driver operator who had a hearing defect. But we must all agree that this is a real shattering experience when you are around it.

When steam is used as the working fluid, noise can radiate from high-velocity flow in pipes, valves, and also by venting. Boilers for generating steam are noisy because of combustion phenomena and air aspiration. Use of compressed air requires a compressor and a driver. Both pieces of equipment are substantial noise producers.

Some of the noise associated with pile driving equipment we feel can be eliminated quite readily. Changes to equipment would include replacing of valves and use of silencers on vents. Design changes to boilers, compressors, and diesel drives are also possible. However, some of this type of "band-aid" modifications to these major pieces of equipment are not as effective nor as economical as advance specification of noise abatement accessories on new equipment.

Vibratory equipment for pile driving is a relatively recent development yet to be fully accepted by the construction industry. Yet we feel it has some possibilities. The vibrator is normally operated at resonant frequency. Such equipment is usually quiet since the only noises obtained are from the motor and the hum of the vibrator. In addition, ground vibrations extend only a few feet away compared to the drop hammer.

The fact that pile driving rates are theoretically many times faster with the vibrator equipment than with conventional equipment could be an added benefit in this connection.

Earth moving and dragline operations also produce relatively high noise levels. Sound levels with these types of operations have been increasing with the newer, larger equipment since horsepower has also been increasing. Such equipment usually—and I say "usually" because in some cases it does—has no provision for exhaust mufflers, or, if it does, the operator tends to take it off because there is some sacrifice in effective horsepower with the use of these noise silencers.

Jackhammers and impact hammers can radiate considerable sound power, particularly when a large number of units are operated simultaneously. Noise is generated by the exhausting air as well as sound resulting from the impact force. Use of new materials for sound dampening and silencers on exhaust air vents would reduce noise substantially in this connection.

Pneumatic silencers, which are comparatively simple and cheap, can reduce noise levels considerably in the critical mid-frequencies.

Some of the newer model hammers incorporate a silencer within the tool jacket, which is desirable.

Compressors and diesel drives required in the air supply system are also noise producers. Use of mutes on air intakes, better mufflers on motor exhausts, and acoustic shields or barriers would reduce noise levels of this type of accessory equipment.

Riveting operations are also in the high noise category. Sounds thus produced can persist for long distances through massive steel structures. Dampening is extremely difficult if not impossible during normal work routines for this type of noise. However, changes in operations are often possible through the use of squeeze-riveting equipment, for example, or by employing alternate joining methods with less noise generation such as welding and use of high-strength bolts.

Concrete mixers can be made less noisy by utilizing heavier construction of the mixing bucket or by employing a sound-absorbing coating on the inside shell, and consideration should also be given to using reinforced plastic gears for this type of equipment.

Attention in the engineering design and specification writing phases of new industrial plant projects and other construction projects as well can also help in the reduction of construction noise levels. The designer and specification writer must keep in mind the construction methods and equipment that will be needed to meet their specified end requirements, and alternate approaches allowing the use of less noise-producing construction equipment and methods should be specified whenever possible.

A major advancement in the state of the art of noise abatement in industrial plant construction and other construction as well can be realized if permissible standards of sound pressure or sound power levels are assigned to specific items of construction equipment. Manufacturers should be required to produce sound pressure level data, noise frequency composition, and other broadcast characteristics of their products. Unfortunately, only a limited amount of data is currently reported by construction equipment manufacturers. The construction industry itself will have to take the responsibility for obtaining noise level data on equipment under actual operating conditions.

A uniform basis for reporting sound pressure levels must be agreed upon by the various equipment manufacturers. For each type of equipment, operating conditions, distance-measurement criteria, and directionality characteristics must be developed under controlled environment.

If noise abatement programs are accelerated, as has been the case with other pollution abatement programs, the impact on the industrial plant construction industry may be startling. Well-meaning regulations unless prudently imposed may result in greatly increased costs on industrial plant projects which are already staggering under ever-mounting wage rates and reduced worker productivity. Work slowdowns or stoppages could easily occur until construction methods are revised and equipment is modified or replaced to meet legislative requirements for noise abatement.

Careful attention must be given to the establishment of reasonable noise abatement standards for the construction industry and also to the planning of a timetable for stepwise enforcement so that the costs of compliance do not become excessive. Such excessive costs if encountered would ultimately be passed on to the industrial plant owners and consumers, of course, and would serve to further deter the capital expansion programs of industry which are already so badly crippled as to be currently hardly existent in most industries with which we are familiar.

Dr. Meyer: Thank you, Mr. Walk, for a very well thought out summary of the problem and some of the thoughts that you have as to what might be done. Later today we will be hearing from some of the equipment manufacturers as to how they may go about implementing some of these suggestions, and I do appreciate the considerable depth of review you have given to the problem. I will ask my colleagues if they have any specific questions. Mr. Baron.

Mr. Baron: Of course, a great deal of my interest is in the urban area which in a sense is not your problem if you are working doing construction in open space where the main problem is the employee. However, I think we can assume that most of what you said can also apply to urban populated areas.

Mr. **Walk**: Yes, it certainly can. And, of course, some plants do go into the urban areas, and here the neighbors are a much greater consideration, how they react to the noise and what effect it has on them.

Mr. **Baron**: Now, in your abstract you say that known technology can reduce most noise levels below the objectionable point when applied to construction equipment and methods. The "objectionable" point is a very interesting thing, because that's the thing we are all in a sense groping for. What did you have in mind as the objectionable point?

Mr. **Walk**: Well, I don't think that I would be qualified to give you an answer with regard to a level on the dB(A) scale or anything of that nature. I will simply say that in my opinion the objectionable part varies considerably with given individuals and given conditions of what surrounds the environment in which the particular construction operation is being carried on. So this is quite a variable type of situation.

When I speak in terms of objectionable conditions in terms of thinking here, however, I am thinking particularly with regard to those provisions of the Walsh-Healey Act and other legislation that industrial plant owners are now striving to comply with.

If we apply these same types of standards over into the construction industry, this is the type of thing I have in mind.

Mr. **Baron**: I just want to raise a point. Certainly when you talk about vairables you wouldn't consider a hundred types of design criteria for a hundred conceivable situations. Obviously that wouldn't be a logical design approach. And I hope that eventually we get into this question of the variables, because I think that is a very interesting point.

You say on page 2 that most plant owners are quite interested in having effective noise control in their respective industries and that most of your work is in the South. Can we assume that the statistics we hear that 6 to 16 million American men are being made deaf in American industry applies to other areas and not to the areas in which you work?

Mr. **Walk**: Of course, I am speaking here naturally from our experience particularly in recent years, since the recent years are those in which industry has become so concerned about noise problems.

And what I say here is factual. That is, we feel that there is a general good awareness of the importance of a good sound or noise abatement program in industry. For example, industries that we deal with are coming out and developing for themselves or having others, outside consultants, develop for them what they call maximum noise levels for plants and equipment. I have a copy of one right here by one of the major oil companies. All of our clients are coming around to this sort of thing.

Mr. **Baron**: On this business of higher costs, now, a lot of the industrial plant is old and is not new, and I don't know if you want to take the time now, but this question of the costs of reducing existing industrial plant noises should be gone into. Because though it seems to be a truism that it costs more to reduce noise after design than before, or after construction of something than before, there does seem to be some inconsistency or not accurate understanding of what the exact cost is.

It would vary I imagine with different situations. We have to consider not only the dollar cost, don't we, but potential loss of hearing threat as against the dollar cost of retrofitting something?

Now, on page 3 you talk about the temporary nature of the construction noise and better to be tolerated. Don't the new concepts of environment kind of suggest that we think about not subjecting people to stresses in the environment that could be avoided? The "temporary nature" description of construction noises has been used in the past to exonerate construction noise from controls and from design requirements.

In the first place, I'm wondering if you couldn't agree with me that it may be temporary, but, on the other hand, so is life, as one environmentalist once put it, Ron Lipton, temporary too. And if you have a construction project that may last a year or two, you can call it temporary in one sense, but are you not degrading the environment, using that phrase, for a significant period of a human being's life?

And the other is whether we should be forced to tolerate—that word is very interesting because it crops up quite frequently in the noise field—excessive noises and not be thinking—this organization again is called the "Environmental Protection Agency"—of reducing the number of things we have to tolerate, especially as you indicate when many of them could be designed so that we don't have to undergo this uncomfortable and potentially damaging type of experience?

Mr. Walk: Mr. Baron, I think that you and I could readily agree that the noises that all of us seem to be forced to tolerate should in many cases not be existent. So there is no disagreement there at all.

I make the statement here simply as an observation on my part that this is why—one of the reasons in our opinion why—there has been less pressure to date brought to bear on the construction industry, because it is of a temporary nature and people simply seem to tolerate things that they think are going to be gone in a few weeks or a few months where they do not want to tolerate things that are longer lasting.

Dr. Meyer: If the gentleman would yield for a minute so the Chair might make an observation. What you say is quite true as far as the temporary nature of a specific project. But one of the problems in the really urban centers, the 200-some-odd metropolitan areas, is that there is a continuous tearing down and rebuilding going on, so that while one project may be temporary, such as tearing down a building and replacing it with another one, once it is replaced maybe two blocks away another building is being torn down and being rebuilt.

So that in the areas that Mr. Baron is talking about, and some of the other larger metropolitan areas we are familiar with, it really amounts to almost a continuous state of construction operation. Again, what we are interested in is that sometimes major construction operations now seem to go on for years. The building of a freeway system or, as in the Nation's Capital, a metropolitan transit system involving a subway probably extends for a period of maybe 8 to 10 years of actual very heavy construction. So I think one of our problems here is that the public has in the past felt they could put up with these things because it would disappear in a year

But now, in a year it doesn't disappear any more. It's still there, or something is going on on a much longer basis.

The other observation I would make relates to what Miss Suter said, what Mr. Ellwood said, what the members of the panel have all said, including yourself. There seems to be a real problem area in which we need to do more research. And that's why do people not complain as much as one would expect them to? We have been making some initial studies on this in the Environmental Protection Agency. There is a need for a great deal more information as to the tradeoff that goes on. Do you have anything further, Mr. Baron?

Mr. **Baron**: On page 4 you say that given the proper incentives enligthened contractors would put in a good noise control program. What do you mean by "proper incentives"?

Mr. **Walk**: Well, incentives can come in many different forms. The most logical one I can think of is some regulations that they will be compelled to follow.

Mr. **Baron**: Because some contractors are starting to use some quieter equipment, and the general argument given is one of fair play for all so those that have somewhat higher cost wouldn't be penalized in a bidding situation, for example, where the noisy but supposedly cheaper equipment would be used and give a bidding advantage. Do you believe that the industry itself could self-regulate as far as moving in the construction industry, in the contracting industry, can self-regulate as far as use of quieter equipment techniques?

Mr. **Walk**: I think you would need some basic guidelines and regulations to cause any industry or any group to bring about some agreement and uniformity of approach which would then in turn put them on the same basis, as you say, in the cost and bidding procedures, and so on.

Mr. **Baron**: You also mentioned you have never heard of a pile driver operator with a hearing defect. Well, we won't go into that, but I think that I'd like to hear later on—

Mr. **Walk**: This was a personal observation. I have never personally heard of or seen one. To me I wonder why really.

Mr. **Baron**: Well, because I think—are you going to open this for discussion later?

Dr. **Meyer**: Yes.

Mr. **Baron**: Because I think this is a very important point, especially under Walsh-Healey regulations.

We are sometimes told in the New York area at least that you cannot use quieter pile drivers because you have to use the impact type of pile driver to determine the soil condition or something and you have to measure how many fractions of an inch you go with each blow.

Can you make a point about that? Do you believe the quieter pile driver can be used under all conditions?

Mr. **Walk**: I would say that I firmly hope that it can be used, because a proper attack and solution in this area to me would eliminate what I personally consider to be one of the most objectionable type noises related to heavy construction of all types, whether it be for tall buildings or for heavy industrial plant structures or what have you. I think this is an area that does need some further development.

I mentioned this vibratory type approach as being something that there has been some development and experimental work done in that area, but as of now it has not been accepted by the construction industry, design and construction industry, as being something that is a satisfactory alternate.

I believe though that with proper study and research that the areas that you mentioned could be circumvented.

Mr. **Baron**: Also I believe with hydraulic pile drivers. They may have originated in England. I understand there is a quieter one in Japan. And there is an American quieter hydraulic pile driver.

Mr. **Walk**: I didn't attempt to mention all the alternates here but just examples.

Mr. **Baron**: One last question. Again in consideration of cost don't you believe, thinking of an urban area and also of possible damage to the employees, and so on, that cost must again be interpreted not only in terms of direct dollars but this business of what we now call external costs of damage to the environment, using that in a very broad sense?

Mr. **Walk**: No question about it. This would certainly apply to all environmental type controls.

Dr. **Meyer**: There is one comment that the Chair would make in that regard. I was very intrigued with the statement that the rate of drive on the vibratory pile driver was apparently considerably faster than that of conventional equipment. Therefore, in the cost-benefit analysis one would also wonder that, if by getting quieter equipment that works better, wouldn't the industry recover the capital cost at a quicker rate because the equipment would be doing a more efficient job and driving more piles in a finite period of time than could be done with the noisier equipment? I think this is one of the tradeoffs from an engineering viewpoint and a capital investment viewpoint that needs looking into. And, of course, this Agency is going to look at all aspects of this.

Mr. **Walk**: Certainly. I might comment on that. When one almost owns a pile driver or several of them, then one wants to continue to use that pile driver.

Dr. **Meyer**: Right. Dr. Bender?

Dr. **Bender**: Just a quick question concerning cost. I wonder if you could give us a quantitative feel for the incremental costs involved in using quieter equipment? For example, you mentioned squeeze-riveting equipment instead of the usual riveting equipment which kind of hammers the rivet over. Do you have any feel for how much additional cost is involved?

Mr. **Walk**: The squeeze-riveting operation involves the use of a hand-held tool, if we apply it to the construction industry, that is bulkier, heavier, more unwieldy than would be your normal rivet-driving type equipment.

I would say that the increased cost involved would, of course, be all in construction labor and would be perhaps in the order of magnitude of 10 to 20 percent.

Dr. **Meyer**: Professor Lyons.

Dr. **Lyons**: Let me pursue that. How much would be the increased cost in quieting the operations of digging up Peachtree Street out in front of this building, something they frequently do? What would be the increased cost increment of digging a hole in a chunk of concrete by a quieter technique?

Mr. Walk: What method would you use, Dr. Lyons?

Dr. Lyons: I have no suggestions, but I was wondering if you—

Mr. Walk: I personally do not know of any quieter methods for demolition. This is the main thing that would be involved. The first step in, as you say, digging up a street, an existing street, would be demolishing the existing pavement. The demolishing operation is a very noisy one, and I just don't personally know of any quiet alternate to that.

Now, once the pavement was broken and removed, however, then the actual excavation operation which would take place say with a backhoe or a dragline or equipment of that type— If this power-driven equipment had on it the types of equipment that I mentioned in the paper here in forms of silencers and mufflers, if it had more of its functioning equipment silenced by means of, say, high-strength plastic or shielded gears or pinions or other things so that it would tend to be quieted down more in its own operation, then this would result in some general overall quieting.

Dr. Lyons: As I understand your point then, it is that some operations can and should be quieted, and in other operations to quiet them would prohibit construction or to require quieting would prohibit construction? Is that correct?

Mr. Walk: At least at the present time, yes, until we think of some quiet way of doing a concrete-breaking operation.

Dr. Lyons: So legislation or regulations would have to be selective not upon the amount of noise a machine makes but upon whether the user or builder of that machine thinks he can make a quieter one for some reasonable sum of money?

Mr. Walk: Yes, that's right.

Now, I might back up just a little bit and say that if you wanted to build an enclosure, sound-deadening, baffled enclosure around an area that you were going to break the concrete in, then you would confine that noise to that enclosure. Now, this would be a rather expensive approach but it certainly is one means of shielding that noise from the neighborhood

Mr. Baron: I would just like to point out that if the tenants, whether commercial or residential, either had reduction in rents or were indemnified for the loss of their amenities during this construction phase, then the cost of shielding or finding quieter techniques would not seem so costly.

Mr. Walk: Perhaps not.

Mr. Baron: As it is, it is the noise receiver who bears this cost.

Just one last point. I did see a demonstration of a hydraulic technique for breaking rock which presumably could be used for concrete. It was a very interesting device using a hydraulic-forced wedge to split the rock. The laser has been worked on to some degree. So I think it can be possible to bring that into demolition phase—both shielding and techniques for quieting noise—not only possible but I think it's a must we go into that.

Mr. Walk: Very interesting. Where did you see that?

Mr. Baron: In New York.

Mr. Walk: The hydraulic rock-breaking?

Mr. Baron: Yes.

Dr. Meyer: Thank you, sir.

Mr. McCarthy.

Mr. McCarthy: No questions.

Dr. Meyer: Dr. Okun.

Dr. Okun: Just one brief question. You mentioned the establishment of regulations. Do you feel it would be appropriate to vary regulations depending upon the site? Would it be as necessary to have rigorous regulations in the rural area where the number of poeple affected would be very small as compared with similar construction in a built-up area? Or do you think it would be too difficult to have regulations that would vary according to the setting?

Mr. Walk: Well, I think that this would be an area for some further study. Just to give you my personal, "off the top of my head" opinion, I would feel that stricter regulations should apply in those areas where more people are going to be affected.

Dr. Okun: Thank you.

Dr. Meyer: Thank you very much, sir. This was a very stimulating discussion. It brought forth some ideas that we are going to have to look into as we get further into possible Federal regulatory authorities and the role of the Federal Government and the States in certain of these requirements that we have been discussing. I appreciate your presentation very much, sir.

Mr. Walk: Thank you, Mr. Chairman

Dr. Meyer: We are running a bit behind schedule, but I think it is important to get this material into the record. What we don't finish today we may have to carry into tomorrow. I would like now to ask Mr. George Diehl of Ingersoll-Rand to come and tell us about some of the very interesting work that corporation has been doing in the field of noise control associated with construction machinery and eqquipment. I am very pleased to have this presentation, which I think we all will find to be a stimulating and informative review of what can be done about some of the problems that Mr. Walk and others have discussed.

STATEMENT OF GEORGE DIEHL, INGERSOLL-RAND RESEARCH INC.

Mr. Diehl: Mr. Chairman, panel members, ladies and gentlemen, we have been discussing areas where sound control is needed in some of the construction equipment. I am going to show you what is being done along those lines, and I have some slides to show you, actual photographs of the equipment.

I think everyone will agree construction work is usually noisy. High horsepower gasoline and diesel engines, large-capacity air compressors, powerful rock drills and demolition tools, pile drivers, and other heavy duty construction equipment has been designed, in the past, to do as much work as possible and very little or no thought was given to sound control.

But the situation is different today, and quieter machinery is in demand. Because large portable air compressors produce one of the most objectionable noises on city construction projects, they have been a major target for noise control. They are noisy in their own right, and, in addition to that, they are located close to the public. As many as eight or nine of these large units may be lined up along a curb close to the sidewalk where people must pass. And they are close to apartments and stores and offices where people have to live and work, and they remain there for many months, sometimes into the years.

I wonder if we could dim the lights and show some of these slides to show you what I am talking about.

(Slide)

This slide shows how the large portable compressors are lined up along the curb. And normally it isn't the small compressors that are involved. It's the large size—and quite a number of the large units too. And each one will produce about 110 dB(A) at a distance of 3 feet or 1 meter. That is about twice as loud as a subway train roaring into a station, each one of those.

In the middle of a field, the sound pressure level would decrease 6 decibels each time the distance from the compressor is doubled, but in large built-up areas this is not so. That is a beautiful reverberation chamber, and the sound is reflected back and forth many times in the buildings, from the buildings, and it usually decreases very little with distance.

You notice here the doors on these compressors are open, and they are heavy duty machines, and they are meant for continuous duty, and a large amount of heat must be dissipated.

Each compressor there would dissipate enough heat to heat about eight average-size homes in the winter months, and not in Atlanta but in the Northern States too.

Now, quieting these compressors is a job in sound control not because of just the problems of reducing noise but to get rid of that heat when you do enclose it. Next slide.

(Slide)

This shows the noisiest compressor that Ingersoll-Rand Company makes. We call it a "whisperized" compressor. It can be quieted, and this shows how it was done.

This compressor has been reduced from 110 dB(A) at 1 meter, 3 feet, to 85 dB(A).

Now, on a somewhat more simplified basis you can say each time you subtract 10 decibels you cut the loudness in half, so a 25 dB(A) reduction is quite dramatic. And the best way to demonstrate this is to show these large unsilenced compressors alongside the quieted units, and you readily notice the difference.

These compressors actually make less noise than traffic noise at some of the intersections.

Next slide, please.

(Slide)

This shows how the air flow is directed in these compressors. It comes in as shown there, and it goes back across the unit and then out the top. And it required the installation of a special muffling, damping, sound isolation, complete enclosure. Next slide, please.

(Slide)

This shows how the levels compare on the two.

Now, you heard about the need for a uniform basis of evaluation. The compressed air industry has such a sound test code. It is now an American National Standard too. It's NCS 5.1 That has recently been established as a national standard. And that requires measurements of construction equipment at a distance of 1 meter—this is in metric units because it's international too—and 7 meters. And you see there that the red lines show the silenced unit and the blue lines show

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[*] All slides used for this presentation are on file at the Office of Noise Abatement and Control.

the unsilenced unit at both 1-meter and 7-meter distances. This is octave band distribution. On an overall basis it turns out to be 25 dB(A). Next slide, please.

(Slide)

This is a chart we have arranged to show where you would have to be on the unsilenced unit compared to the silenced one to get 85 dB(A). The large blue contour shows how far back you must be on the unsilenced unit, and the little white one there shows how close you can be to the whisperized one.

Next slide, please.

(Slide)

Now, you just saw the original version there. This has now been expanded to 1200 c.f.m. compressors. The other one was a 900 c.f.m. And this has the same characteristics, the same 85 dB(A) at 1 meter. Next slide.

(Slide)

That's another slide of the same thing. Next slide.

(Slide)

This shows the interior construction. You can't see there, but there is a large fiberglass fan which has an air foil section, and it turned out to produce about twice the pressure drop to get the cooling and actually took less engine horsepower than the original one. This takes less horsepower than to drive a fan.

But really when you say that quieter equipment can do more work because you are using the energy that presently went into sound, that doesn't work out. Because the energy that goes into sound is very minute, and in some types of construction equipment we can even show that with noisy equipment the noisier it is the more work it's doing. So really you don't save anything as far as the operating efficiency goes by making it quieter. Next slide.

(Slide)

Now, this shows another high-noise maker on construction projects. This is the 80-pound-class paving breaker. These paving breakers are usually farther away from the public than the air compressors which are right along the curb. They may be down in the excavation. But they are still a major source of noise.

And the largest component of rock drill noise—that is, paving breakers or jackhammers or whatever it is— is the exhaust. About 90 percent of the noise comes from the exhaust. We have identified all the sources of noise. We know where it comes from. And you can't do anything about rock drill noise unless you get rid of the exhaust noise first.

Now, this shows a muffler on the side there with a little box on the side that only sticks out a few inches, and it does not decrease the performance of the tool but it reduces the noise about 8 decibels. Sometimes you get as much as 10. And when you go beyond that you find that the steel noise, the impacting steel, takes over, and that must be worked on next.

Now, we are working on that problem now. At the moment we are able to get somewhere between 8 and 10 decibels on rock drill noise. Next slide.

(Slide)

This shows how that muffler works. There is no absorption in it. If you put absorption in a rock drill muffler the moisture in the air usually freezes and prevents the tool from operating in a short time. This muffler does not prevent it. It has reversal of direction and gradual expansion to effect the sound control. Next one.

(Slide)

This is a new type paving breaker that has been developed with no external muffler. It is done inside. And this breaker alone cost about $300,000 to develop. It uses an entirely new impacting mechanism. It has much higher productivity than the standard breakers and less noise. And it's much easier to hold. The vibration level is much lower than the standard breaker. Therefore, the productivity increases. Next one.

(Slide)

This shows a comparison of the noise of the muffled breakers and the unmuffled breakers at 1 meter and 7 meters. You can see there's about 8 to 10 decibels there. The yellow line, of course, is the SB8 paving breaker which you just saw. Next one.

(Slide)

Noise controls also apply to the larger drills, in that at the top of the tower there you see a muffler which reduces the noise about the same as what you saw on the paving breaker. The air exhaust is carried up through the channels to the tower and out through a chamber type muffler out the top. That puts the noise away from the operator by a greater distance and also reduces it. Next one.

(Slide)

This shows a closeup of the muffler at the top of the tower. The drill moves up and down the tower to drill the hole but the muffler stays there at the top. Next one.

(Slide)

This is another type of demolition tool. We call it a "Hobgoblin." It's mounted on a backhoe. The business end is just the part out here. It looks like a large rock drill and it's mounted on any backhoe. This is hydraulically operated. It has no air exhaust, and therefore the major source of noise is reduced. And it can do the work of 10 to 24 regular paving breakers, quieter operating. Next slide.

(Slide)

This shows a camparison of 10 standard paving breakers on the top compared to what we call the Hobgoblin at the bottom.

Now, on some demolition jobs this same tool can outperform 24 paving breakers, so that noise difference there, that level of dB difference, would be still greater. This is 10 units which it can very easily handle on a very concerted basis.

Sometimes they show improvements in sound control on a percentage basis. And I just show you this to point out that it's not the best way to do it. Because if you subtract 3 decibels you're taking away half the sound power, and if you take away 20 decibels or 25 you're taking away 99 percent, leaving only 1 percent, and everyone knows that you have more than 1 percent left.

So we're making an effort now to change this to show on a loudness improvement rather than on a percentage basis. Because even though it is mathematically correct to show the improvement on a sound power basis and you can show that it is true, it's not what you hear.

Thank you very much.

Now, these slides then show some of the efforts that are being made to reduce construction equipment noise. In the past several years, Ingersoll-Rand has spent over $2 million on sound control of construction equipment, and in the past year we have decided to tackle the problem at its source and we have given a series of lectures to all our design engineers. We call those lectures THINK "QUIET." The idea is to get as many design engineers thinking about applying acoustic principles as we can possibly get.

We feel that the end products are bound to come out quieter if we have the design engineers thinking of the application of acoustic principles.

We don't subscribe to the theory that progress must be accompanied by an increase in noise, and we are working along those lines to prove that.

Thank you.

Dr. **Meyer**: Thank you very much, sir, for a stimulating presentation on what has been done in producing quieter equipment. Before I asked my colleagues on the panel if they have any questions, would it be possible to get for the record some of the educational material that you mentioned—this series of lectures? I would like to include that as an attachment to your presentation in the report to the Congress, unless it is company confidential or something of this sort.

Mr. **Diehl**: I write these lectures—there are about eight to ten lectures—and they are now being published in the Ingersoll-Rand Compressed Air Magazine. And they will be reprinted as a combined series at the conclusion of this.

At the moment though we could certainly see that you get copies of the current ones. There have been about five produced so far.

If you'd like, I could send them to you.

Dr. **Meyer**: Yes, sir, I would appreciate that very much, along, of course, with reproducible copies of your illustrations.*

Mr. **Diehl**: Yes.

Dr. **Meyer**: Very well, sir. I will now ask my colleagues if they have any specific questions.

Dr. Okun.

Dr. **Okun**: Just a brief question. If a contractor is going to equip himself anew, about what order of magnitude of increased cost would be these new devices as compared with the original?

Mr. **Diehl**: On the compressors, the difference between the unsilenced and the whisperized units is about 10 percent.

On the paving breakers we're now putting on the mufflers at no extra cost because we think that these units should be quieted, and the way to do it is to add them at no extra cost—that is, zero.

On the large tractor type drills, sound control would be about 10 to 12 percent.

And on some of the medium-sized ones where the price of the tool is less but the sound control is the same, it might be 15 to 18 percent, in that range.

Dr. **Okun**: Thank you.

Dr. **Meyer**: Mr. McCarthy.

Mr. **McCarthy**: Not so much a question as a comment—that I am delighted to hear of a firm who believes in the theory of being able to work profitably towards the solution of some of our environmental problems. And I think this presentation is an excellent example of how there is money to be made in controlling pollution as a general thought.

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* The material requested is on file at the Office of Noise Abatement and Control.

And I would like to just suggest that I hope we can see more of this in the future. Thank you for your contribution.

Mr. **Diehl**: Thank you.

Dr. **Meyer**: Thank you, Mr. McCarthy.

Dr. Lyons.

Dr. **Lyons**: The whisperized compressors have a noise level of approximately 80, 85 dB(A)?

Mr. **Diehl**: 85 dB(A) at a distance of 3 feet.

Dr. **Lyons**: So with these compressors it would still be impossible to carry on a conversation on the sidewalk adjacent to the compressor?

Mr. **Diehl**: Did you say it would not?

Dr. **Lyons**: It would be nearly— Well, "impossible" is a bad word. It would be difficult to the point of being almost impossible to carry out a conversation adjacent to one of these compressors?

Mr. **Diehl**: No, on the contrary, we find that we bring for demonstrations secretaries there and dictate letters to them, and they hear it just fine right alongside the compressor. That is, I know, above a speaker, but they do it just the same.

Dr. **Lyons**: Let me put it another way. I believe one threshold of annoyance level that has been bandied about is that you are annoyed by noises in excess of about 50 dB(A)—

Mr. **Diehl**: Right.

Dr. **Lyons**: —and that you start getting speech interference at about 70, 75 dB(A).

Mr. **Diehl**: Yes.

Dr. **Lyons**: So you're talking about a present-day noise level in excess of these ranges that people generally consider annoyance. So this would still be an annoying noise source.

Mr. **Diehl**: Yes, it would be. On a relative basis it's more annoying than some other sources. It wouldn't be anywhere as annoying as the three-piece string combo that I heard last night at dinner where we couldn't talk at all.

Dr. **Lyons**: My point is it appears that in reduction of the annoyance factor in construction we still have a long way to go in just reducing the noise of portable compressors.

Mr. **Diehl**: Yes, we have a long way to go in all construction work.

Dr. **Lyons**: It costs 10 percent extra to get from 115 to 90 dB(A) or 85 dB(A).

Mr. **Diehl**: 85.

Dr.**Lyons**: What is it going to cost to get down below 70 dB(A) or some value that would be considered unannoying?

Mr. **Diehl**: I can say that the dollars per decibel increase as you get lower and lower. And we do go from 110, say, to 105, and that 5 decibels off there you can do for practically nothing. When you go from 90 to 85 the cost is quite substantial.

So, to answer your question, to go from 85 to 75 or 70 would be quite a job. It would also mean things like accessibility would be decreased at service. On this one the service is very easily handled. It is accessible.

We find that not just on construction equipment but in industrial type plants where customers are asking for sound control—and, incidentally, practically every inquiry that comes into the plant now has a sound specification attached—we find that it's not good to recommend or request lower levels than you actually need because the price goes up quite a bit and the accessibility is decreased.

For example, on the rotating equipment, customers have to monitor vibration on shafts periodically during the day. If they can't get at them or they can't change bearings, they pay for that privilege.

So right now I think that a law should be written to require sound control and low enough noise that it will be an improvement and can be reached with effort, but not so low that it is going to increase costs excessively.

Dr. **Lyons**: Would you say that the 85 dB(A) level of your whisperized compressor is about as far as technology and $2 million can get us?

Mr. **Diehl**: Oh, by no means, no. We can get lower than that. We can go down much lower than that on compressors. But I wanted to point out again now that that means increased cost and means less accessibility for maintenance and operating conditions, and so on. Theoretically we can get down to the ambient street noise.

Dr. **Okun**: In other words, in a very sensitive location where perhaps the noise was extremely important, it might be worth a contractor making a special investment even though maintenance was more difficult, but to meet that very special circumstance it could be done technologically today?

Mr. **Diehl**: Oh, yes, very definitely. This is not all we can do from a sound control standpoint. It's all that we think we should do at the moment.

Dr. **Meyer**: Anything else?

Dr. **Lyons**: No.

Dr. **Meyer**: Dr. Bender.

Dr. **Bender**: I think we have seen an interesting contrast in attitudes toward noise control. We heard earlier that some construction equipment has little or no provision for exhaust mufflers. It was also mentioned some construction contractors take the mufflers off their equipment. And now we hear your company has spent $2 million in developing quieter equipment.

What has been the incentive for developing quieter equipment and why do you suppose it is that some contractors are still working with noisy equipment and noisy equipment is still being produced?

Mr. **Diehl**: Well, to answer those several questions, we feel that there should be a market for quiet equipment. We think that manufacturers should take the lead in developing quiet equipment to show it is available. We know there is a need for it. And if manufacturers don't make it, it's liable to create the impression that it's impossible.

Now, your second question—

Dr. **Bender**: But it's not altruism, is it, really? Are there any legal requirements on contractors or are contractors getting sick and tired of hearing complaints or what? Do you have any feel for what the incentive is on that?

Mr. **Diehl**: Yes, we made that whisperized compressor before there was any law requiring it. We felt that if it were available, to show that it would be available, that perhaps requirements would be imposed to require contractors to use it. But it was made before laws were passed. In fact, I don't know whether there are any laws right now that require it.

Dr. **Meyer**: There are not.

Mr. **Diehl**: Yet we have a line of quiet compressors available, and muffled.

Mr. **Baron**: Could I add something? We played a role in this development—Citizens for a Quieter City. I went to Europe in 1966 and saw some quieter compressors and paving breakers, and we imported one from England and gave a demonstration. I believe you were there, George, weren't you, and other members of Ingersoll-Rand?

Mr. **Diehl**: Yes.

Mr. **Baron**: And the Compressed Air and Gas Institute, the Institute of Mayors, several Congressmen, and so on. And we showed the American public there was better equipment. And they apparently have been thinking about this and helped initiate the development.

And on this business of altruism and so on, from our point of view, of course, Ingersoll-Rand has done a fantastic thing in this in taking the lead in this before there is any requirement that you use quieter equipment. And there are now I believe two or three quieter compressors on the market.

But one of the questions I would like to ask again. With two 85's in tandem, then you have 88, according to the law of adding decibels. If you had three, you'd have 91 or something like that. So that there is still a design problem which you recognize. Isn't part of your problem the power plant?

I mean if you had a power plant which didn't require this tremendous application of barriers and mufflers and so on, your life would be a little bit easier.

Mr. **Diehl**: Very definitely. The major source of noise was the engine exhaust, and the second largest noise is the fan noise on the engine. And then down the line there was compressor-radiated noise and things like that. But if we had a quieter engine it would be a much easier problem.

Mr. **Baron**: This is something for all of us to think about, about the power plant.

Dr. **Meyer**: Yes.

Mr. **Baron**: The other question is on the rock drill though. I think you will agree that the exhaust muffler will not really solve the problem. You mentioned your work on the impact area. Do you have any timetable on that?

Mr. **Diehl**: No. There have been many things tried on the impact. It just seems that there are engineering factors working at cross-purposes there. You have to get very low damping in the steel to get the energy into it. If you try to put in damping it cuts down the ream of the steel.

Incidentally, that major noise in the steel is not just the longitudinal impact. It's the transverse vibration that causes the problem. If you try to damp that you cut down the energy that goes into the rock.

But there are things we are doing about the steel. We're trying to handle that problem now, and we're making successes with it.

Mr. **Baron**: You have no idea of the timetable?

Mr. **Diehl**: No.

Mr. **Baron**: Rock drilling especially in the city is a fantastic problem. It's grizzly. I'll use that kind of language if I may be permitted. What is the life— I'm sorry. Were you through? I forgot you had the floor.

Dr. **Bender**: Go ahead.

Mr. **Baron**: What is the life span of a compressor, pavement breaker, and rock drill?

Mr. **Diehl**: I couldn't tell. They go for many, many years.

Mr. **Baron**: So the 10 percent or whatever it's increased—remembering the concept of the fact the environment is paying the cost of a noisy piece of equipment—is not that great.

Mr. **Diehl**: That's right.

Mr. **Baron**: This is an important point for all of us to remember.

Mr. **Diehl**: That's right.

Dr. **Meyer**: Dr. Bender, do you have any further questions?

Dr. **Bender**: No, not at this time.

Dr. **Meyer**: Well, ladies and gentlemen, because it is now approaching noon and we are catching up with our schedule, we will recess, to reconvene at 1:00 o'clock, at which time we will continue with the presentations on what may be done using the best engineering and scientific and technical capabilities. We have an interesting afternoon, and I hope everybody will stay with us on this very important national issue. Thank you very much. We will reconvene promptly at 1:00 o'clock.

(Whereupon, at 11:55 a.m., the luncheon recess was taken.)

AFTERNOON SESSION

1:30 p.m.

Dr. **Meyer**: I would like to reconvene this session. In the interest of ensuring that everybody who has been invited to participate has that opportunity, I don't want to impose any rules of silence but I would appreciate it if we could keep this moving along with a reasonable time schedule. If you have a very long prepared statement, I would like it for the record and would prefer that you summarize. Again, this is a usual way of doing it. And I will trust that my colleagues on the panel will recognize the importance of our trying to get all of these things in the record.

Also, because several people have indicated to me that they have firm airline commitments, I am going to move a couple of the participants from out of town ahead of some of the local folks. I hope the local folks will not think that we are being unduly bureaucratic in so doing.

I would like to now ask Captain Riley of the Training Division of the Atlanta Police Force, or his representative who is here, to be ready to come on following Mr. Edwin. I know that he is busy and I don't like to keep our law enforcement people away from their important duties. I will switch him in ahead of another gentleman here so that he may return to taking care of his duties with the police force. So, Captain Riley, or his representative, if you would come forward, we will be happy to hear from you, sir. Welcome to our meeting.

STATEMENT OF CAPTAIN DAVID H. RILEY, TRAINING DIVISION, ATLANTA POLICE DEPARTMENT

Captain **Riley**: Enclosed in these prepared statements that you have are copies of our City of Atlanta Ordinance Section 20-30, which is the primary ordinance used by the Atlanta Police Department to abate unlawful noise.

Also I have attached in there our City of Atlanta Ordinance 18-316, which is Atlanta's Improper Muffler Ordinance.

I have also enclosed the Georgia State Law on Improper Mufflers, which is very similar to our city ordinance. And the law governing horns and warning devices is also attached to the State law.

The City of Atlanta Ordinance 20-19 which prevents the discharge or possession of fireworks is also attached.

THE GEORGIA STATE MUFFLER LAW AND ATLANTA ORDINANCE 20-19, AS SUBMITTED.

Sec. 20-30. Noises; prohibited, enumeration.

(a) It shall be unlawful for any person to make, continue or cause to be made or continued any loud, unnecessary or unusual noise or any noise which either annoys, disturbs, injures or endangers, the comfort, repose, health, peace or safety of others in the city.

(b) The following acts among others are declared to be loud, disturbing and unnecessary noises in violation of this section, but such enumeration shall not be deemed to be exclusive, namely:

(1) *Horns, signaling devices.* The sounding of any horn or signaling device on any automobile, motorcycle or other vehicle on any street or public place in the city, except as a danger warning, the creation of any unreasonably loud or harsh sound by means of any such signaling device and the sounding of any such device for an unnecessary and unreasonable period of time. The use of any signaling device except one operated by hand or electricity, the use of any horn, whistle or other device

operated by engine exhaust and the use of any such signaling device when traffic is for any reason held up.

(2) *Radios, phonographs, similar devices.* The using, operating or permitting to be played, used or operated any radio receiving set, musical instrument, phonograph or other machine or device for the producing or reproducing of sound in such manner as to disturb the peace, quiet and comfort of the neighboring inhabitants or at any time with louder volume than is necessary for convenient hearing for the person who is in the room, vehicle or chamber in which such machine or device is operated and who is a voluntary listener thereto. The operation of any such set, instrument, phonograph, machine or device between the hours of 11:00 p.m. and 7:00 a.m. in such a manner as to be plainly audible at a distance of fifty feet from the building, structure or vehicle in which it is located shall be prima facie evidence of a violation of this section.

(3) *Loudspeakers, amplifiers for advertising.* The using, operating or permitting to be played, used or operated of any radio receiving set, musical instrument, phonograph, loudspeaker, sound amplifier or other machine or device for the producing or reproducing of sound which is cast upon the public streets for the purpose of commercial advertising or attracting the attention of the public to any building or structure.

Announcements over loudspeakers can only be made by the announcer in person and without the aid of any mechanical device.

(4) *Yelling, shouting, etc.* Yelling, shouting, hooting, whistling or singing on the public streets, particularly between the hours of 11:00 p.m. and 7:00 a.m. or at any time or place so as to annoy or disturb the quiet, comfort or repose of persons in any office, dwelling, hotel or other type of residence or of any persons in the vicinity.

(5) *Animals, birds.* The keeping of any animal or bird which by causing frequent or long continued noise shall disturb the comfort or repose of any persons in the vicinity.

(6) *Steam whistles.*[*] The blowing of any steam whistle attached to any stationary boiler except to give notice of the time to begin or stop work or as a warning of fire or danger or upon request of proper city authorities.

(7) *Exhausts.* The discharge into the open air of the exhaust of any steam engine, stationary, internal combustion engine or motor boat except through a muffler or other device which will effectively prevent loud or explosive noises therefrom.

(8) *Defect in vehicle or load.* The use of any automobile, motorcycle or vehicle so out of repair, so loaded or in such manner as to create loud and unnecessary grating, grinding, rattling or other noise.

(9) *Loading, unloading, opening boxes.* The creation of a loud and excessive noise in connection with loading or unloading any vehicle or the opening and destruction of bales, boxes, crates and containers.

(10) *Construction or repair of buildings.*[*] The erection (including excavating) demolition, alteration, or repair of any building other than between the hours of 7:00 a.m. and 10:00 p.m. on weekdays, except that the building official may determine when the loss or inconvenience that would result to any party in interest is of such nature as to warrant special consideration, then the building official may grant a permit for a period not to exceed ten (10)days or less for such work to be done within the hours of 10:00 p.m. and 7:00 a.m.

(11) *Schools, courts, churches, hospitals.*[†] The creation of any excessive noise on any street adjacent to any school, institution of learning, church or court while the same are in use, or adjacent to any hospital, which unreasonably interferes with the working of such institution, or which disturbs or unduly annoys patients in the hospital; provided, that conspicuous signs are displayed in such streets indicating that the same is a school, hospital or court street.

(12) *Hawkers, peddlers, vendors.*[‡] The shouting and crying of peddlers, hawkers and vendors which disturb the peace and quiet of the neighborhood.

(13) *Noises to attract attention.* The use of any drum or other instrument or device for the purpose of attracting attention by creation of noise to any performance, show or sale.

(14) *Transportation of metal rails, similar materials.* The transportation

of rails, pillars or columns of iron, steel or other material over and along streets and other public places upon carts, drays, cars, trucks or in any other manner so loaded as to cause loud noises or as to disturb the peace and quiet of such streets or other public places.

(15) *Pile drivers, hammers, similar equipment.* The operation between the hours of 10:00 p.m. and 7:00 a.m. of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist or other appliance, the use of which is attended by loud or unusual noise.

(16) *Blowers.* The operation of any noise-creating blower or power fan or any internal combustion engine, the operation which causes noise due to the explosion of operating gases or fluids, unless the noise from such blower or fan is muffled and such engine is equipped with a muffler device sufficient to deaden such noise.

(17) *Sound trucks.** The use of mechanical loudspeakers or amplifiers on trucks or other moving or standing vehicles for advertising or other commercial purposes.

The use of sound trucks for noncommercial purposes during such hours and in such places and with such volume as would constitute such use as a public nuisance; provided, that the provisions of this section shall not apply to or be enforced against:

(a) Any vehicle of the city while engaged in necessary public business.

(b) Excavations or repairs of streets by or on behalf of the city, county or state at night when public welfare and convenience renders it impossible to perform such work during the day.

(c) The reasonable use of amplifiers or loudspeakers in the course of public addresses which are noncommercial in character. (Code 1953, § 36.55; Ord. No. 1967–16, § 1, 2–20–67)

Sec. 18-316. Prevention of noise, fumes and smoke.

(a) *Muffler required; cut-outs prohibited.* Every motor vehicle shall at all times be equipped with a muffler in good working order and in constant operation to prevent excessive or unusual noise and annoying smoke, and no person shall use a muffler cut-out, by-pass, or similar device upon a motor vehicle on a street or highway, except that this section shall not apply to farm tractors.

(b) *Excessive fumes, smoke prohibited.* The engine and power mechanism of every motor vehicle shall be so equipped and adjusted as to prevent the escape of excessive fumes or smoke.

(c) *Type of muffler.* The muffler herein required shall be of the same type and style as that placed on the vehicle by the manufacturer thereof. (Cum. Supp., § 30.191)

Sec. 20-19. Fireworks.

(a) *Possession, discharge.* It shall be unlawful for any person to possess, burn or shoot rockets or firecrackers or any kind of fireworks or to possess or explode dynamite cartridges or torpedoes.

(b) *Sale, storage, distribution.* It shall be unlawful for any person to sell, dispense, give away or in any manner dispose of for use within city limits any such fireworks or other explosives referred to in subsection (a) within the corporate limits of the city; provided, however, that nothing in this section shall prevent any manufacturer or wholesaler from manufacturing, storing, warehousing or transporting any of such articles within the corporate limits of the city; nor shall any provision in this section prevent the receiving of such articles by any manufacturer or wholesaler from points outside the corporate limits of the city, from storing articles within the city and shipping such articles to a point outside the corporate limits of the city. (Cum. Supp., §§ 36.24, 36.25)

68–9935. Violations with respect to sale of certain mufflers and muffler attachments.—Any person violating the provisions of paragraph (c) of section 67–1717, which prohibits the sale of certain mufflers, muffler cut-outs, bypasses or similar devices, shall be guilty of a misdemeanor and upon conviction thereof shall be punished as for a misdemeanor. (Acts 1962, p. 653.)

68–1716. Horns and warning devices.—(a) Every motor vehicle when operated upon a highway shall be equipped with a horn in good working order and capable of emitting sound audible under normal conditions from a distance of not less than 200 feet, but no horn or other warning device shall emit an *unreasonably loud or harsh sound* or a whistle. The driver of a motor vehicle shall when reasonably necessary to insure safe operation give audible warning with his horn but shall not otherwise use such horn when upon a highway.

(b) No vehicle shall be equipped with nor shall any person use upon a vehicle any siren, whistle, or bell, except as otherwise permitted in this section.

(c) It is permissible but not required that any commercial vehicle be equipped with a theft alarm signal device which is so arranged that it cannot be used by the driver as an ordinary warning signal.

(d) Any authorized emergency vehicle may be equipped with a siren, whistle, or bell, capable of emitting sound audible under normal conditions from a distance of not less than 500 feet and of a type approved by the department, but such siren shall not be used except when such vehicle shall sound siren when necessary to or in the immediate pursuit of an actual or suspected violator of the law, in which said latter events the driver of such vehicle shall sound said siren when necessary to warn pedestrians and other drivers of the approach thereof. (Acts 1953, Nov. Sess., pp. 556, 612.)

68-1717. Mufflers, prevention of noise.—(a) Every motor vehicle shall at all times *be equipped with a muffler* in good working order and in constant operation *to prevent excessive or unusual noise* and annoying smoke, and no person shall use a muffler cut-out, bypass, or similar device upon a motor vehicle on a highway, except that this section shall not apply to tractors.

(b) The engine and power mechanism of every motor vehicle shall be so equipped and adjusted as to prevent the escape of excessive fumes or smoke.

(c) It shall be *unlawful* for any person *to sell* or offer for sale any muffler which causes *excessive* or *unusual noise* or annoying smoke, or any muffler cut-out, bypass, or similar device for use on a motor vehicle, or to sell or offer for sale any motor vehicle equipped with any such muffler, muffler cut-out, bypass, or similar device. (Acts 1953, Nov. Sess., pp. 556, 613; 1962, p. 653.)

Captain RILEY: Generally, the Atlanta Police Department's policy —and this is generally, except in unusual cases—on the enforcement of the ordinance, Section 20-30, is to gain voluntary compliance with the ordinance without actually booking a case whenever possible. Of course, common sense has to prevail in all cases when the Atlanta police answer a call on violation of a noise ordinance.

Section 20-30 of the Offenses and Miscellaneous Provisions of the City Code of Atlanta is a pretty extensive ordinance governing many different kinds of unlawful noise. Now, I don't know whether you'd want me to go into all of that or not or whether you have time for that. I can tell you what the policy of the Police Department is on each one of them, on enforcement of it, if you like.

Dr. MEYER: I think, sir, for the purpose of this hearing, which is dealing primarily with noise associated with construction or construction equipment, if you would—

Captain RILEY: That's included in this.

Dr. MEYER: —if you would just give us a little brief statement as to—

Captain RILEY: Well, generally, as I said initially here, the policy is to gain voluntary compliance with these ordinances if it's possible. Now, in aggravated cases, cases where the violators will not voluntarily cease a violation, then we issue a copy of charges, which does not place them in jail but requires them to come to municipal court, and then we subpoena the complainants.

You know, the courts have ruled you can't disturb the police. You have to have somebody that the noise has disturbed. And so we always get them to come to court to tell about how the noise disturbed them. And, of course, we can testify as to what we heard when we got there.

But I would say that very few of these cases get to court because of the fact that people do comply when the police go and tell them that they are disturbing someone.

Of course, construction people are aware of these laws. You know that you can't have construction after 10:00 o'clock at night to 7:00 a.m. in the morning. There are special emergencies. If it's an emergency, they can get a special permit from the building inspector and they can have construction during those times, but it's looked into by the building inspector, and then I think it's only 10 days that they can do that and must complete that work within that time during those hours.

Of course, as I say, the Atlanta ordinance is five or six typewritten pages. It covers most all types of noises that disturb people in Atlanta.

That's all I have.

Dr. **Meyer**: I'd like to ask my colleagues here if they have any specific questions they want to address to you regarding your experiences with law.

Mr. Baron.

Mr. **Baron**: One, of course, that interests us directly is No. 10, which is construction, and I see that what you have is the traditional law which most cities have in the United States, with some modifications, and that permits construction noise, any degree of construction noise, as long as it fits in between certain hours. And that's the case, isn't it?

Captain **Riley**: Yes, sir.

Mr. **Baron**: They can make all the noise they want, use any equipment they want?

Captain **Riley**: Yes, sir. It's not measured in any way I know, decibels or however they measure noise.

Mr. **Baron**: No restrictions other than the hours?

Captain **Riley**: No, sir.

Mr. **Baron**: And this is the traditional local ordinance.

Dr. **Meyer**: Yes. Any other questions, Mr. Baron?

Mr. **Baron**: That would also apply to schools and Churches, and so on?

Captain **Riley**: There is a special section in here about schools and churches, if you will notice. Section 11 here governs that. They have to be marked is one requirement of it.

Mr. **Baron**: That wouldn't prevent the construction job or anything like that.

Captain **Riley**: No, sir. They'd have a special permit from the city for that.

Mr. **Baron**: If they do construction?

Captain **Riley**: Yes, sir. They may be adding on to the hospital. They have to allow construction.

Dr. **Meyer**: Dr. Bender?

Dr. **Bender**: Certain cities are developing laws that limit the actual level of sound that can be made under different circumstances. Sound can be read on a meter, and then if it exceeds the prescribed level there is a violation. Now, there is some question as to the enforcement of these laws. The question is whether the police department should be involved in enforcing them or whether a separate group of environmental specialists should be involved in enforcing laws concerning the environment.

How would you feel about having your policemen carrying sound level meters around and measuring the level and enforcing it? Do you think you'd like to have your staff do that or do you think you'd rather see that in another area?

Captain **Riley**: The police are reluctant to take on any more duties than we already have. Of course, any law that you pass is no better than the enforcement that you can get on it, because you are certainly not going to get voluntary compliance.

The American people seem to think at times all you have to do to solve a problem is pass another law, and they have the same bunch of people enforcing them, and they don't add to them and provide people and equipment to do that. And what happens is that all the enforcement is watered down if it's enforced at all. Either they drop something else that they are enforcing in order to enforce that. When you're already doing all you can do, something has to give.

Of course, I haven't thought about this before as to who should enforce that. I have never thought about policemen having machines that could measure the amount of sound that's coming from, say, construction or a muffler or something. It seems to me that would be a scientific way to do it. Whether or not policemen should do it I don't know.

I say if we do, give us some more policemen and give us some time to train them.

Dr. **Meyer**: That's a fair response. Along those lines, if the Chair might point out, I have with me a device that is used in England. They have recently passed a much stronger vehicle law, and most of their policemen are using this simplified gadget. But it certainly seems to me that you have raised an interesting point, as to how far you burden the police department with this sort of responsibility. Professor Lyons.

Dr. **Lyons**: I have no questions.

Dr. **Meyer**: Mr. McCarthy.

Mr. **McCarthy**: I believe the point has been covered.

Dr. **Meyer**: Very good. Thank you very much, sir. I have only one last question I would like to ask you. You say that in the main you have been able, just because you are the Police Department—generally to get voluntary compliance when a complaint is filed.

Captain **Riley**: Yes. I'm talking about generally, you know. You have aggravated cases.

Dr. **Meyer**: Certainly.

Captain **Riley**: And you have some people that will get out there and whoop and holler and wake up everybody and there's nothing else to do but make a case.

Generally when we have a complaint we go to them and tell them that, "You're disturbing your neighbors, or we have had a call that you are," and they immediately will quiet down. It's not always the case, but I'm talking about most of the cases in general.

Dr. **Lyons**: May I ask a question, Mr. Chairman?

Dr. **Meyer**: Yes.

Dr. **Lyons**: If the Police Department observes construction be-

tween the hours of 10:00 and 7:00 in the morning, do you make any check to see if the contractor has a license or special permit?
Usually most all noise violations generally begin, and it's not
Captain RILEY: You mean do the police initiate the investigation?
always— Generally we have a complainant. That's the reason we are aware of it, not from our patrol.

Now, I'm not saying that we don't run up on it in our patrol and enforce it at times, but it would be rare. Generally someone has been awakened by that or is disturbed by it and calls us and that's the way it's brought to the attention of the police.

Dr. LYONS: Would you estimate that a high percentage of the contractors who do night work in Atlanta comply with this regulation of obtaining a permit?

Captain RILEY: Oh, I would say they do comply with it, yes, sir.

Dr. MEYER: Thank you very much, Captain. We appreciate your taking the time to come and we're sorry we got started a little late.

Captain RILEY: Thank you, sir.

Dr. MEYER: Continuing with our presentations regarding engineering and control and the general state of the art, we have invited a representative of an organization that has been involved in this sort of activity for some period of time, Mr. Edwin Jackson of the Delta P Corporation, to give a presentation on their observations. I won't steal his thunder by talking about what his firm has been doing. I will let him include it in his presentation.

STATEMENT OF EDWIN JACKSON, EXECUTIVE VICE PRESIDENT, DELTA P INCORPORATED

Mr. JACKSON: I don't know everything, Dr. Meyer. I have already learned something that has given me hope. As the parent of a teenager I wanted to thank Miss Suter for saying although a rat would die on a 120 dB rock and roll music, a human being wouldn't and I'm encouraged by that. (Laughter)

It would be difficut for anyone to present to this panel something new or unique on noise control associated with the design and operation of construction equipment. But is something unique or new required? The need in most cases is not to develop but rather to implement what is available.

Although more effort must be expended to reduce the economic impact, the state of the art exists for solving most of the problems of the construction industry.

For well over 40 years there have been complaints about construction equipment and machinery noise. Equipment such as bulldozers, portable air compressors, rock drills, etc., may produce over 100 dB(A) at the operator's ear. Authorities in the field seem unanimous in their opinion that this level will impair hearing.

The main thrust of my presentation today will not be on the technical aspects of the problem but more on the management aspects. I believe I have an unusual position at this hearing since I am wearing three hats: first, as a citizen I demand a quiet environment; second, as a manufacturer of silencing equipment I want to market my products; and, third, as a manager of a manufacturing operation, I resist additional costs for quieter machinery without direct, immediate return on investment.

I hope this presentation will be helpful in further defining the problem.

In the way of technical beakground, Delta P and its parent company, Burgess Industries, have long been involved in the noise control field. Burgess is a name that has been connected with the field of acoustics for many years. Dr. C. F. Burgess, in forming the company, originated many of the basic ideas of noise control today. The association with technical excellence has been continued at Delta P.

Our background and data on products and services are included in the substantiating documents that I will present later.

My first thought upon receiving the invitation was to have one of our acoustical engineers present a discourse on the state of the art and our capabilities in design technology for silencing equipment and machines of the construction industry. After analyzing and rethinking, it was my opinion that this was unecessary and redundant.

For example, as long as 3 years ago it was reported at the Conference on Noise as a Health Hazard that:

"(1) We have developed silencing packages for engine-powered air compressors, which have the potential for abating nuisance noise at construction sites.

* * *

"(3) To control operator position noise levels, manufacturers have developed silencing packages for reardump trucks, loaders and other earth-moving equipment. These silencing packages are available as customer options."

The paper concluded with this statement: "I would like to say that there are no great technical barriers for better control of vehicular noise."

This was over 3 years ago, and yet we don't see these incorporated in a widespread manner.

This is not to say that we have technically arrived. There is still much work to be done, and the field of noise control still resembles an art rather than a science in some aspects. There is a need for developments to minimize the economic impact on the construction industry. This will be discussed later.

What I am saying is that standard approaches are adequate as they now exist for the great majority of the noise problems. An example of this approach would be the development of a vent or blowoff silencer that is now a standard catalog item. These items were developed for the petrochemical and chemical plants such as ammonia, methanol, and nitric acid plants for the contractor during construction and startup.

These silencers were developed by (1) defining the problem, (2) deciding upon the approach, (3) designing the equipment, and (4) field testing and redesign until satisfactory results were obtained. It was an empirical approach based upon our experience in the field.

Figure 1, which the panel has, presents a typical data chart for approximating unsilenced noise levels from the vents and blowdowns.

(Figure 1 follows:)

Low frequency noise is produced from low pressure, large valve, mass flow vents. High frequency noise is generally synonymous with high pressure, and small valves. This frequency has been found to be related to the jet speed and the diameter of the jet at the nozzle of the valve.

The peak frequencies may be predicted from the geometry of the valve. Harmonics of this frequency account for the broad-band noise usually noted in vent analysis.

Selection of silencer type is a function of both the frequency content of the noise to be silenced and of specific application requirements.

If you will, gentlemen, the Figure 1 is an empirical approach to silencing that has been found effective. An application engineer at a district sales office could arrive at a reasonable answer from this chart. It's down in the application area. We are not in the development area.

An interesting note on this vent or blowoff silencer is that they are only used during the construction and startup stage. The contractors at first were not receptive to the need, but after a trial basis there is now almost universal acceptance. This is based on (1) improved working conditions and (2) reduction of construction and startup time.

If you will, these plants are in the boondocks and so there is not a complaint from the neighbors. It's put in because of the employees and their increased efficiency.

I would also add this is an isolated case where economics dictate the use.

To summarize, technical breakthroughs are not the major requirement. Standard application engineering as illustrated solved the venting noise problem in the construction of chemical plants. The problem is to get these standard silencing techniques introduced universally into the construction industry.

Looking at the economics of noise control and the case against, I believe the basic problem of noise control is still economics. Performance is not improved in equipment or machines when silencing is added; in other words, the noise that is attenuated after it is generated. Costs varying from 1 percent to 10 percent are typically added to the equipment. In addition, operating costs are increased especially when mufflers are used.

Various studies have looked at the problem of economics in trying to prove that reduction of workmen's compensation, for example, would more than offset the cost of silencing. They make a good case, but a convincing one to management.

What the industry does is internalize the cost of the noise. From a management viewpoint this is a very logical and natural approach within the construction or any industry. The problem is the social cost—or Mr. Baron would say the externalized cost—that is paid by others who have nothing to do with the construction industry. This cost is the basis for the complaints over the last four decades.

Our present system does not adequately put the cost of unwanted noise on the producers. They are borne by the public instead. It is hard to quantify the cost savings resulting from a quieter environment. It is very debatable that we can ever prove that a quieter environment will save operating costs for the construction industry.

As can be seen from the above statements, there is no economic incentive now to the construction industry, and, in fact, there is a penalty.

The case for economics, however. There are benefits for the construction industry. Performance is generally improved where the cause of noise is eliminated. It can be effectively argued that with a reduction of noise at the construction site there will be less damage to health through hearing loss by the operator. In the normal case, increased productivity comes as a direct result of noise abatement. Easier and clearer communication results when there is no distracting noise. By removing an annoying noise source, intangible benefits are derived for all personnel.

From my personal observations, I have become convinced that a greater benefit than immediate productivity increase is possible. In a quiet environment management is able to attract more competent workers. The possibilities can be quite dramatic as to who is available for the work.

In my own personal situation where the noise environment is very similar to the construction industry, we have in the past attracted people who have a record of high turnover and high absentee rate. By presenting a quieter environment, we are able to attract workers who will be more valuable employees. It is not a dramatic short-trem benefit, but a possible long-term improvement benefit for the construction industry.

What can and what should be done? I believe the only answer is proper legislation with adequate enforcement. As we weigh the pros and cons, experience says that except in isolated instances the economics of noise will win out over the economics of silence. I do not believe self-contorl or self-regulation alone by the construction industry will solve the problem. It will require direct regulation at the construction site.

Although I cannot recommend a definite formula or program, subsidies to the industry or economic incentives should be considered during the transition period. This can help to naturally and easily tip the economic balance for a quieter environment.

I do not believe that the economic impact will be as severe as some would indicate. The American Petroleum Institute, for example, reported in the *Fortune Magazine* of October 1969 that the costs of compliance to the Walsh-Healey Act by the petroleum industry alone would be $40 to $50 million to modify its existing equipment. Delta P has been quite involved with the petroleum industry and the petrochemical industry and has yet to see such expenditures.

It would appear the petroleum industry has been able to comply with the provision of the Act for less than they originally had stated.

I would also point out that with the proper study, analysis, and research there are breakthroughs possible that would reduce the cost of ownership. And, sadly, I would report that the present competitive nature of the acoustic field will insure that the buyer receives his money's worth from any manufacturer of silencing equipment.

With more interest and involvement by government, I believe the direct financing and undertaking of research and development on noise and noise control is a must. Based on my own personal experience, remarkable results can occur.

This can occur through technological innovation. The remarkable results I am talking about come from breakthroughs in equipment design, getting back to the basics outside of the acoustics field perhaps. Not just an improvement on existing designs, not a better approach to silencing, but a new concept is required to eliminate the noise source.

I believe there are possibilities that need exploration with the help of the Federal Government that may work to the betterment of manufacturer and user. A personal example in which I was involved concerned replacing an AC to DC rotary inverter for the Polaris submarine electrical system with an electronic static inverter in the interest of noise reduction. The result of this development was, in fact, a quieter piece of equipment.

As you could expect, the initial cost of this equipment was approximately double the price of the equipment it replaced. In the 9 years since this development took place however, the price of this equipment has dropped. And more important—based on the Navy's own study of the program—the cost of ownership is now considerably less than the original equipment, the rotary inverter.

This is due to two factors: (1) the equipment lasts longer; and (2) there is practically no maintenance or reliability problems.

I believe such breakthroughs are possible within the construction industry if the proper development is encouraged by the Federal Government. Although the noise reduction in this instance was for a different purpose than what we are now talking about, it illustrates that the effort in noise reduction requires a new technical approach to an old design problem and will result in an economic advantage for the customer as a byproduct.

In conclusion, I would make the following three recommendations:

1. We need additional legislation with technical meaning in quantitative terms and enforceable language. This will neither penalize nor give competitive advantage to a manufacturer or user of construction equipment and machinery.

2. We must understand the economic realities of the situation. In addition to direct regulation, I believe subsidies and economic incentives should be considered during the difficult transition period.

3. We must encourage analysis and research into the problem to better identify and solve these problems with specific emphasis on how new concepts could lead to quieter and better equipment.

Thank you.

Dr. **Meyer**: Thank you very much, Mr. Jackson, for a candid viewpoint from your 3-headed position. I will now ask Mr. McCarthy if he has any specific questions he would like to direct to Mr. Jackson.

Mr. **McCarthy**: Again I don't know that I have specific questions other than to make a comment that I think the change or the attitude expressed is again a positive one for showing what can we do to solve the problem rather than to explain all the problems associated with abating noise pollution. And I think that is the basic attitude that we are just going to have to encourage, and I hope to see it proliferate.

Thank you.

Mr. **Jackson**: Thank you.

Dr. **Meyer**: Professor Lyons.

Dr. **Lyons**: I have no comments.

Dr. **Meyer**: Mr. Baron.

Mr. **Baron**: I just want to ask a question. The package for air compressors is for the exhaust silencing or exhaust and intake?

Mr. **Jackson**: It's mostly, as Ingersoll-Rand so well put it, for the exhaust. The problem is not only in compressors. Diesel engines. Gas turbines. The exhausts are the main areas. And depending upon the requirements, you then have to go to the intake and eventually even to the mechanical noise enclosing the piece of equipment itself.

Mr. BARON: I understand that if you put a good silencer on an air compressor on the exhaust you will knock off about 10 dB in the large size. From 105 you go to about 95.

Mr. JACKSON: You can do better than that, but that would be easily done.

Mr. BARON: With the silencer? Just an exhaust silencer?

Mr. JACKSON: Yes.

Mr. BARON: But you can do better than that with an exhaust silencer?

Mr. JACKSON: Yes, you could do better than that. I would say, oh, if we're talking about the compressor and what we can do to the exhaust, in the order of 15 dB would certainly be expected.

Mr. BARON: They usually talk about two kinds of dB reference points. One was dynamic something or other. I didn't quite follow it. Actual reading was 10 dB. If you read it with a sound level meter and you put on this good exhaust, you'd get 15 dB reduction?

Mr. JACKSON: You'd see the reduction, yes.

Mr. BARON: The other question was brought up by the previous speakers—the concept if you use a good muffler you will cut down operating efficiency, backup pressure, and so on.

Mr. JACKSON: Yes, your back pressure will affect operating efficiencies.

Mr. BARON: Significantly? Because I have been told yes and no. I have been told a good muffler or silencer matched to the proper power source will improve operation.

Mr. JACKSON: I would take issue. If this was the only thing done it would not improve operation.

Mr. BARON: How much would it—

Mr. JACKSON: Maybe 3, 5 percent drop in efficiency.

Dr. MEYER: Dr. Bender.

Dr. BENDER: I just would like to comment possibly on this question of muffler efficiency. Isn't it true for a 4-cycle engine you decrease engine efficiency with a muffler but for a 2-cycle engine the effect of reflecting waves back into the engine can have a beneficial effect? That is, when you take a muffler, a tuned muffler, off the 2-cycle engine you can get degraded performance, that it's better with the muffler on?

Mr. JACKSON: I would like to defer that. It could be true. I'm not an acoustical engineer. But I would say for whether that's possible—Howard, would you care to comment?

Dr. MEYER: Would you identify your colleague?

Mr. JACKSON: This is Howard Burris. He's engineering manager of the Turbine Silencer Division of Delta P.

Mr. BURRIS: There is a difference between 2- and 4-cycle engines obviously. With a tuned exhaust system on a 2-cycle engine, yes, a muffler could make a big difference there and can actually improve the efficiency, yes. The 4-cycle, very little effect.

Dr. BENDER: Another question that I had concerns your comment that in the normal case increased productivity comes as a direct result of noise abatement. I have a hard time seeing how quieting a bulldozer or something is going to make it more productive. Could you elaborate on that, give me some sort of a feel for how this happens and what magnitude the increase in productivity might be?

Mr. JACKSON: All right. We're talking about what is the effect of noise. And this is outside of my area. But the emotional or psychic damage to the operator. Does he become fatigued and worn out toward the end? This type of productivity decrease occurs. I think this is what you'd see.

In addition to my statement, if there is noise and you are trying to communicate, maybe there is mis-communication and the man works on the wrong thing at the wrong time. This type of direct productivity decrease occurs.

Dr. MEYER: Thank you very much, sir. I appreciate your information, which we find to be very useful. Changing the schedule a little bit, not only because someone has an airplane to catch but because it fits in with the preceding presentation so nicely, I would like to ask Mr. Palazzi of the Associated General Contractors of America to come forward and give us the general contractor's viewpoint.

FROM THE FLOOR: He has gone to check out of his hotel. He should be back soon.

Dr. MEYER: Fine. I will then proceed and ask that Mr. Wellington of the Detroit Diesel Division of General Motors come forward, if he's present. Happy to have you with us, sir. We have heard a great deal from the independent consultants about some of the technology, and I am most happy to welcome you here, to talk about your views on this problem.

STATEMENT OF ROGER D. WELLINGTON, STAFF ENGINEER, TESTING AND DEVELOPMENT, DETROIT DIESEL ALLISON DIVISION, GENERAL MOTORS CORPORATION

Mr. WELLINGTON: Thank you, Mr. Chairman.

Mr. Chairman and members of the panel invited by the Office of Noise Abatement and Control of the Environmental Protection Agency:

I am Roger D. Wellington, Staff Engineer, Testing and Deveopment, Detroit Diesel Allison Division, General Motors Corporation, and I am here in response to your invitation to discuss the subject of noise from diesel engines. I have responsibility for the direction of projects undertaken to control the noise level of diesel engines.

At the outset, I want to emphasize that it is my understanding I have been invited to speak on the problems of noise emissions and control as they relate to diesel engines alone. Other witnesses who have appeared before you today are experts on mufflers and and they have already identified and discussed the significant noise problems which result from the uses to which these engines may be put. For reasons which will become clear in a moment, Detroit Diesel Allison does not have a muffler expert in the professional sense, although it does employ engineers who are knowledgeable on the subject.

Basically, manufacturers of diesels recognize that noise emanates from the engine exhaust and the air intake as well as from the engine structure itself. Exhaust noise is controlled by the use of an exhaust muffler. Intake noise is controlled by a silencer, usually built into the air cleaner. Structural strains of the engine are transmitted directly to the air as noise and, to a lesser but important extent, as vibrations through the engine mounts, to chassis, or other supporting frame structure. Engine structure noise may be controlled through engine mounts, by enclosures or possible modification of engine components.

As a manufacturer of diesel engines for approximately 280 separate equipment manufacturers, we recognize that some of these engines are noisy, depending upon the application and silencing equipment which is used or not used. Without purporting to be an expert it is generally recognized that a poorly muffled diesel engine, for example, may emit rougly 110 dB(A) to the ear of the operator. With good muffling equipment and engine enclosure, noise from the same engine may be reduced to about 90 dB(A).

At this point it is important to understand the role of the diesel engine manufacturer in the production of vehicles and equipment used in the construction industry. Diesel engine manufacturers are responsible only for production and performance of the engine itself. The control of noise from the exhaust and intake is in the hands of the equipment manufacturer who, in designing for the application and use of the engine, will specify the type of equipment to be used in controlling these major noise sources. Additionally, the equipment manufacturer designs the engine compartment which is another important control of engine noise.

Such components as mufflers, air cleaners, engine mounts, fans, etc., are known as application material, and as such are purchased by equipment manufacturers from specialists, just as a diesel engine is purchased from a specialist.

And it is important to note that, while some of these components are noise control units, others are additional noise sources.

What I've said to this point distinguishes between the areas of responsibility which are properly assigned to the equipment manufacturer and those which remain the responsibility of the engine manufacturer. I would now like to explain some of the problems an engine manufacturer faces in reducing the mechanical noise of the engine as opposed to the gas noise.

In considering the possibility of a change in design to achieve a quieter engine, it is first necessary to identify the noise sources in the engine itself. After excluding intake and exhaust noise by piping it out of the test facility, the Noise and Vibration Laboratory at the General Motors Proving Ground established some twelve sources of engine noise.

As part of this research project, each noise source was studied and a laboratory fix undertaken to reduce its contribution to total noise from the engine. This study has produced some promising findings, although no single change explored made a discernible difference.

The technical changes incorporated in our engine by the Proving Ground were primarily adaptable only for laboratory studies and not usable on commercial engines. For example, a cog belt instead of gears was used for timing although it could never be used to drive accessories normally powered by the engine gear train. Secondly, piston clearances were reduced for the limited laboratory run beyond the production minimum known to be necessary in order to prevent seizures.

In a parallel study, also conducted at the Noise and Vibration Laboratory at the Proving Ground, significant noise reductions were shown to be possible by completely encapsulating the engine.

This leads us to the conclusion that significant and practical efforts to reduce noise of construction machinery are likely to take place in the areas of improved gas silencing (mufflers and intake silencers) and acoustically designed enclosures.

Still, it might be asked why changes in the engine suggested by laboratory experiments have not been incorporated in production units. The answer is simply that much of the data is so new that we have not had sufficient time for full evaluation and implementation. Moreover, we are continuing research in the same direction through contract with the University of Southhampton, England, under the guidance of Professor T. Priede, Chairman, Automotive Engineering Group at the University. Additional research of a supplementary nature to that being done in Southampton, England, to General Motors contract, is currently being conducted at our Engineering Laboratories in Detroit.

However, the main effort at our Detroit Laboratories consists of work to accumulate fundamental noise data on engine models now being built. This includes exhaust noise data, intake noise measurements and determination of the close noise field of our basic engines. With such data, original equipment manufacturers who purchase our engines will be able to apply them successfully to their own equipment designs in order to meet expected national noise emission standards. I should like to make clear that we shall in no way abandon our customers who, finding themselves limited in facilities, technique, or talent, need our help and experience in bringing their designs to satisfactory noise levels.

In view of the limited opportunity of engine manufacturers to achieve significant reductions in *construction equipment* noise, testimony as to the ultimate effects of noise reduction programs upon the power, efficiency, size and weight of diesel engine operations should be presented by equipment manufacturers. Of the laboratory changes in engine design discussed earlier, none would influence these operation factors significantly.

Finally, in exploring some of the alternatives for achieving quieter diesel engines, one option is to derate the engine so that it will operate at only a portion of its capacity. While data developed initially in England is currently under re-evaluation because of new tests using U.S.-type diesel engines, it may be expected that a 6 dB(A) reduction in basic engine noise, measured three feet from the engine, can be achieved by derating the engine so that its top operating speed is reduced 40%.

Derating engines is never seriously considered. To do the same work, it would be necessary to use a second derated engine or a larger derated engine, either solution increasing the noise until the net gain might be 3 db for a large increase in cost.

At this point, it may be appropriate to observe that the basic reason behind development of today's powerful construction equipment is to cut construction time and thus provide lower costs ultimately to the consumer.

As I said in the beginning, we remain committed to making improvements in our products necessary to make them both acceptable to our customers and in compliance with Government regulations. It is possible that some of our research programs now being conducted by independent groups will provide information on how changes developed in the laboratory can be moved to the production line. If this happens, some of our future designs may incorporate improvements of the type suggested here.

This concludes my formal statement. At Detroit Diesel Allison, we appreciate the opportunity to offer our comments on the problems of noise. I will attempt to answer any questions the panel may wish to ask.

Thank you.

Dr. Meyer: Thank you.

Professor Lyons.

Dr. Lyons: I have no questions at this time.

Dr. Meyer: Mr. Baron

Mr. Baron: I just want to express my disappointment at the information that the power plant for the air compressor, for example, itself cannot be significantly reduced, because in my experience over quite a few years with this problem of construction noise the buck has been passed from the maker of the engine—For example, I talked to one of your executives a few years ago when we went and toured the Proving Ground and the Noise and Vibration Laboratory, and he said, "Yes, we can make a quieter diesel engine. Nobody asked for it."

Then we talked to the manufacturer of compressors, and they said, "We have to use the engines that are on the market."

And then we again talked to one manufacturer and he says, "Muffling is an accessory that has nothing to do with us."

So I would merely like to clarify this situation and voice my disappointment to hear an official statement that we can expect very little in terms of reduction of the propulsion plant itself, because I think we have to seriously think of electric motors and other sources of energy for construction if this is the case.

Because as was pointed out before by the maker of equipment, there is a limit, economic limit, to which they can go without getting down to the noise levels that would be necessary, because the 85 that was mentioned in the air compressor is not significant if you have three, four, or five air compressors in tandem.

And yet as you start to go down lower using the existing power plant you run into serious problems.

So that I would merely like to say that this information is disappointing.

Mr. Wellington: I'd like to answer that a little bit. First of all, remember that the disappointing part of it to you is from the standpoint that I didn't think that we were going to reduce structural or basic engine noise a great deal. The muffler people have already said that if people will put on proper muffling they will reduce it a great deal.

Now, there is no point in reducing engine noise, basic engine noise, until the masking noise is removed. Now, our research toward reducing engine noise is aimed at that point when the masking noise is removed. But I don't think we have a responsibility until we can get the masking noise removed.

Mr. Baron: By masking noise you mean—

Mr. Wellington: The airborne noise or the air-created noise, the noise that comes out of the tailpipe, the noise that comes out of the tailpipe particularly, the fan noise and the noise for the intake which generally is pretty good.

Mr. Baron: But steps have been taken in that direction, haven't they, by three or four companies using air compressing—

Mr. Wellington: You're going to be pleased with that 85 dB.

Mr. Baron: It's a beginning.

Mr. Wellington: At the beginning, yes. You're going to be pleased with it. And we're not abdicating our responsibility to carry it beyond that. But you're not to that point yet.

Mr. Baron: In other words, you feel that you can do more than 85 with intake and exhaust silencing?

Mr. Wellington: No, I say that when you get down there is about the time that the engine noise comes in. However, there's still a great deal that can be done even just by encapsulating. But this becomes a problem of maintenance of the engine structure itself. But the noise can be reduced.

Now, one of these days we'll get down to the point where we can't compete with quieter power perhaps.

Mr. Baron: I'm not clear about something. You said reduce the masking noise. You don't feel that the steps that have been taken by Ingersoll-Rand, Gardner-Denver, and so on, are as much as can be taken to reduce the masking noise? I'm trying to get clarity.

Mr. Wellington: I think they have done excellently. I think that you would be very pleased in a situation even in the City of New York where that was done.

Mr. Baron: Right now, but your statement was if the masking noise is reduced to satisfactory levels that you would then proceed more actively, if I interpreted it correctly, to the reduction of the power plant noise.

Mr. Wellington: Yes, it's a fine point. There are two ways to go on the power plant noise. One is to get the power plant itself less noisy. The other is to prevent that noise from getting to anybody's ears.

Now, Ingersoll-Rand has gotten it down there by preventing it getting to anybody's ears. This is one of the cheaper ways of doing it because right now I can't get the power plant noise down but you sure can prevent it from getting to the person's ears.

Mr. Baron: You think the work in Southampton and so on will show some near-future application as far as power plant?

Mr. Wellington: I'm afraid that what we're talking about is comparatively few dB at 3 feet.

Mr. Baron: Well, as we pointed out, 85 is much better than 105. But if you're operating two, three, four, or five compressors in tandem, you're generating a lot of noise because you're adding 3 dB, aren't you, for every unit?

Mr. Wellington: Well, this is true if the 3 dB were all coming from a point source. I think I'm right, Dr. Bender.

Mr. Baron: Some of your distances—

Mr. Wellington: If they were all coming from a point source. When it's distributed like that, I don't believe it adds that way.

Mr. **Baron**: Would some of the experts here care to comment on that?

Dr. **Meyer**: Well, it's a tricky question. You double the sound power at the source and you get roughly a 3-dB increase. You string a source out over 300 feet of a city block and you can't really say you have resolved it to a point source.

On the other hand, though, as we have earlier discussed, if you put a line of sources down what amounts to a reverberation chamber of a city's high buildings, your 3-dB law goes out too, because you may be getting standing waves. You may be getting two sources 50 feet apart that would normally be producing only the same general acoustic effect of one source if it were open field. You're now getting 6-dB increase. You have to take this into consideration. It's the circumstances of the exposure. So some of the simple rules of thumb don't work. It could be a much greater increase than you would expect from just the doubling.

Mr. **Baron**: It would certainly seem to justify the stimulation of work on providing for the power plant. That's what I'm trying to indicate.

Mr. **Meyer**: Dr. Bender.

Dr. **Bender**: I have a question concerning the structural noise. Prieda in England who is under contract to you has shown that by modifying the structure of the engine by stiffening the bearing webs and using damped panels for the oil pans and valve covers, and so forth, he can get to the order of 10 or more dB(A) of noise reduction, structural radiation.

Now, are those modifications to an engine significant? Would they affect the ease with which an engine can be produced and the cost of production?

Mr. **Wellington**: Those modifications are worthy of our very close study, and this is one reason that we have that contract. I can't say at this time just exactly how practical those things are. The 10 dB is worth it.

Dr. **Bender**: Yes, I thought so.

You also mention here that 6 dB(A) reduction of basic engine noise would diminish to less than 1 dB(A) when measured at 50 feet. I don't understand that. I would think that a 6 dD(A) reduction would be 6 dB(A) at 50 feet. Do you have any comment on that?

Mr. **Wellington**: I think maybe you caught me. I think you're right.

Dr. **Meyer**: Even taking account of the inverse square law, if you reduce it for one it's going to be the same ratio, except for one thing. And of course you're talking about 50 feet, so you're still in the near field. But if you were out 500 feet, you'd have to take into account the different air attenuation factors of different frequencies, so you might not have a 6-dB drop. You might have considerably less, depending upon the frequency composition of the source. But at 50 feet, you're still within the near field of the sound source that you're talking about.

Mr. **Wellington**: Yes. I'm sorry.

Dr. **Bender**: One other question. Every now and then, you know, we hear rumors that gas turbines are really going to be the thing in the future and that diesels will be no more. Do you have any comment on the future viability of diesel engines as compared with gas turbines?

Mr. Wellington: You mean from a noise standpoint?

Dr. Bender: No, just from a utilization standpoint, Do you anticipate a decrease of production of diesels and increased production of gas turbines?

Mr. Wellington: I made my decision many years ago around 1950. I sat in commune with myself, and I said diesels are going to pay me out. I have seen rotary machinery displace reciprocating machinery in many cases. But the time field I don't think I'm competent to judge on.

Mr. Meyer: Mr. McCarthy.

Mr. McCarthy: No, I think I have heard most of my questions asked.

Dr. Meyer: Dr. Okun.

Dr. Okun: No questions.

Dr. Meyer: Thank you very much. We have had a presentation from a supplier of prime-mover sources. Again taking the Chairman's prerogative of juggling things around a little bit, I would like to ask another user of construction equipment and equipment powered by diesels to speak now. Would Mr. Charles Skinner of the Georgia Truckers Association give us some views from your position, sir of noise as you produce it as a carrier of earth and other construction materials and also as a receiver of noise to which your workers are exposed at construction sites?

STATEMENT OF CHARLES L. SKINNER, MANAGING DIRECTOR, GEORGIA MOTOR TRUCKING ASSOCIATION, INC.

Mr. Skinner: Mr. Chairman, I feel that I ought to preface my remarks by saying that we did not understand until I received this morning some material which indicated otherwise that this particular hearing was to center primarily around construction, and my presentation does not center primarily around construction. It centers around the operation of trucks generally, and I hope that it will be helpful to you, but I feel I should explain that to you before I went ahead.

Dr. Meyer: Well, Mr. Skinner, I apologize about that if there was some failure of communication on our part. And I would like to suggest that if you want to focus primarily on the construction side of this and give a brief summary, and put the rest of this in the record, that is fine. If you are dealing with the larger problem, I would also like to take the opportunity of using your statement at another hearing we are going to have on general transportation problems, or at least include it, with your permission, in the record.

Mr. Skinner: I think my statement more properly should be addressed to your Chicago meeting.

Dr. Meyer: Very good.

Mr. Skinner: I am not qualified or competent to talk about construction equipment since our association is composed primarily of motor common carriers and private carriers who operate the so-called dry freight type of trucks. And I leave it entirely up to you.

Dr. Meyer: Well, you are here, and what I would like to do, which I think would be perfectly proper, is to accept your statement here rather than have it read at length. And I would like to extend to you an invitation to either have it presented in Chicago or have one of us read it into the record for you there. I would also like to ask you, if you feel free as a representative of the trucking association, to receive some questions about some of the things that we have been discussing here with regard to equipment.

Mr. **Skinner**: I will be glad to try. Now, I do not pose in any manner as an engineer. But as concerns the use of trucks, particularly I think you might be interested in the Atlanta truck route system and how it was established and how it has helped to diminish the level of truck noise in the residential areas of Atlanta, so anything like that I would be glad to—

Dr. **Meyer**: I would like that very much, since that does have a bearing on construction. We all know that you can't build something without doing some excavating and without hauling the spoil away. And you can't build something without moving materials of construction from the point of basic transportation and breakdown to the construction site. And I think it would be useful for the purpose of this hearing if you would give us a brief discussion on that and would entertain any questions. Then we will pick up on this.

Mr. **Skinner**: Let me read to you then the portion of this which deals with the Atlanta truck route system.

Dr. **Meyer**: That would be very good.

Mr. **Skinner**: As early as 1955, city officials and truck owners in Atlanta took steps through a cooperative program to plan a network of truck routes designed to give the trucker sufficient streets to do the transportation job required of him but prohibiting the operation of trucks of more than 36,000 pounds gross weight or more than 30 feet in length on as many residential streets as possible.

The initial planning was carried out by the director and staff of the city's Traffic Engineering Department in cooperation with staff members and two or three key members of the Georgia Motor Trucking Association, Inc.

The basic information-gathering technique was to interview the dispatcher for every major truck terminal in Atlanta and find out what streets he considered as absolutely essential for the operation of his larger trucks. GMTA encouraged the dispatchers to consider all alternatives and to ask for as few thoroughfares as possible.

It was chiefly on this type of information and on the premise of assuring continued effective truck service for the city that the truck route system was adopted. Naturally, there were some objections from both individual truckers and from residents of some streets, and it took a good deal of explaining and persuasion to convince some of them that the new system represented in general a marriage of good truck service and the needs of citizens for a reasonably quiet residential environment.

There were other problems which had to be overcome. An exception had to be written into the ordinance establishing the system to allow delivery of items of unusual size or weight to a site served only by a nontruck route.

Sharp corners had to be rounded off to accommodate the larger rigs on some truck routes. Several traffic signals had to be modified, or added.

But these and other needed modifications were made over a period of a few months, and with a minimum of politics involved. Since that time, as Atlanta has grown industrially and geographically, it has become necessary to add a few more truck routes to the system, but the added streets have in most cases been those which have gone "commercial" since 1955.

Karl Bevins, the City Traffic Engineer who initiated the system in cooperation with the trucking industry, considers that it has been "100 percent favorable to the general public" while it may have increased somewhat the costs of motor carriers in serving the city. He agrees, however, with GMTA that indirect benefits to the carriers—such as helping them to plan routes and locate terminals with assurance and to enjoy a much less abrasive relationship with the general public—have made the system as attractive to the carrier as to the home owner.

Before we leave the subject of Atlanta's truck route system, we need to clarify one point. The weight and length standards were established primarily with the van-type, "dry freight" trucks operated by truck lines and many private carriers in mind. And the system has worked exceptionally well in channeling the movements of these trucks. It has not worked as well, according to Mr. Bevins, in the case of trucks such as those which move heavy loads of dirt, concrete, or gravel—generally grouped together as "construction" trucks. These trucks may well be within or close to the 30-foot length limit but well over the 36,000-pound weight ceiling, and the city does not operate any truck-weighing crews.

By utilizing State Highway Department mobile scales and crews and exerting whatever political or economic pressure might be available, the city has been able, according to Mr. Bevins, to discourage the most flagrant violators in this group.

Mr. Chairman, I think that's about all there is on that truck route.

Dr. Meyer: Very good.

Mr. Skinner: I might add quickly in view of some of the previous testimony that our position in our association and that of American Trucking Associations, our parent organization, is that we are users, we are consumers of trucks, and we do advocate Federal restrictions or Federal standards on the manufacture of trucks and also on tires, because we have found at certain speeds tires contribute much more to the noise level than engines and exhausts. We do advocate that standards be set.

Dr. Meyer: Thank you very much. In Chicago we expect to have some of the rubber industry people talking about this tire problem, and I do hope we will be able to work out something with you for that specific hearing, sir. Are there any questions? Dr. Okun?

Dr. Okun: No.

Dr. Meyer: Mr. McCarthy?

Mr. McCarthy: Can you give me just one example of the flagrant violation of these construction trucks? Does that mean deviating from the truck system or just— Is that what it means?

Mr. **Skinner**: Yes, using a street repeatedly at weight levels or size levels which are not allowed on that particular street.

Mr. **McCarthy**: Thank you.

Dr. **Meyer**: Dr. Bender.

Dr. **Bender**: When trucks are purchased, does the purchaser have the option of what kind of muffler to select for it?

Mr. **Skinner**: Yes. I think in almost all cases he may ask for optional muffler equipment, yes.

Dr. **Bender**: Can he buy a truck without a muffler?

Mr. **Skinner**: No, I think the Federal law now requires that every motor vehicle be equipped with a muffler, and this law is directed primarily at controlling exhaust emissions. But the law does require a muffler. I don't think there are any requirements as far as the noise reduction of the mufflers is concerned.

Dr. **Bender**: I see.

Dr. **Meyer**: Mr. Baron.

Mr. **Baron**: Two questions. One, is the trucking industry concerned with the—I don't know what the generic name is—accessory use of trucks, you know, cooling equipment or extra pumps for fuel trucks which are sources of noise emission? Do you understand my question?

Mr. **Skinner**: Yes, I do. We are concerned with it on the national level but we are more concerned right now with the exhaust noise, the engine noise per se, and with the tire noise, these two, and especially at the speeds at which motor vehicles move over the interstate highways the tire noise is much more significant than any other source of noise from motor vehicles of any type.

Mr. **Baron**: Over what speed?

Mr. **Skinner**: Sixty miles an hour.

Mr. **Baron**: The other question was do you have a problem with in-transit or in-motion cement mixers, trucks—that is, part of the construction truck fleet going through the city?

Mr. **Skinner**: Noise problems?

Mr. **Baron**: Yes. Mixing.

Mr. **Skinner**: It has been my observation they are rather noisy, yes, sir.

Mr. **Baron**: Yes. But is the association as an association interested in that kind of noise?

Mr. **Skinner**: Yes, we are, especially from the standpoint of wanting to be as good citizens as possible and from a public relations standpoint, because although our particular part of trucking is not too closely allied or associated with cement mixers and that construction industry, as far as the man in the street is concerned a truck is a truck is a truck, and we get the blame for it.

Mr. **Baron**: Thank you.

Dr. **Meyer**: Professor Lyons.

Dr. **Lyons**: What is the occupational noise exposure of a truck driver? Do you know? Have you seen any figures?

Mr. **Skinner**: In what terms? Decibels?

Dr. **Lyons**: Decibels.

Mr. **Skinner**: No, I don't know. I think that information may be contained—I'm going to leave this with you—in some tests conducted by our national association in 1963 and 1964 called "The Noise Trucks Make."

We are concerned about the noise which the driver is subjected to.

Dr. LYONS: It has been my understanding from the reports that I have read that a truck driving down the highway at about 60 miles an hour with the windows slightly cracked open has a cab noise level in excess of 90 dB(A).

Mr. SKINNER: That may be true.

Dr. LYONS: Thank you. No further questions.

Mr. MEYER: Thank you very much. This was an excellent contribution in showing what can be done to recognize the problem of getting materials in and out of a construction site, and it is very useful as an approach. I would like to talk to you some more about our getting together further. Mr. Palazzi, might we hear from you as to what the various contractors who are part of the Associated Geneal Contractors of America might be doing in the fields of their member constituencies?

STATEMENT OF JOHN PALAZZI, THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

Mr. PALAZZI: Mr. Chairman, Dr. Meyer, members of the panel, my name is John Palazzi. I am a highway contractor from New Hampshire. I am also Chairman of the AGC Environment Committee, which was formed to develop guidelines for our members to enable them to conduct their construction operations with the least disturbance to the environment.

The Associated General Contractors of America, an association of over 9,000 general contractors who perform the major part of this Nation's construction, appreciates this opportunity to comment on the problem of noise resulting from construction operations.

Appearing with me today are Dan Shepherd, also a general contractor and member of the Environment Committee, and other AGC members from the Atlanta area, also representatives from the Georgia Branch of AGC, and also from the AGC National Office in Washington, D.C., staff members.

We support the policy of the Government of the United States to improve and enhance environmental quality through a positive program to implement that policy. We support the inclusion of contractual requirements to reduce the impact of construction operations on the environment provided that such requirements are practical, feasible, and capable of accomplishment. We further expect that they will be clearly described.

Measures and regulations to control noise must be realistic and free of conflict. For example, such a conflict exists in the requirement that backup warning devices on vehicles and equipment must be heard above the noise generated by the equipment. This is a requirement of the Occupational Safety and Health Act and the Safety and Health Regulations for Construction. The noise level of the warning signal is too high. This calls for reduction of the noise created by the equipment's operation, in order that the noise level of the warning device can be lowered.

Our principal problm lies in the equipment we must purchase for our operations. Contractors can, to a certain extent, control some of their operations by limiting their activities to those times of the day when construction noises will be least annoying to people. However, if we were able to purchase equipment with acceptable noise levels, we could then operate on a schedule most convenient and efficient for all concerned.

We look to the manufacturers to produce construction equipment to comply with established standards. We recommend that upon the determination of those standards, manufacturers be required to modify their products to meet those standards. A reasonable lead time to develop and produce this equipment must be allowed. It is not economically feasible to modify existing equipment nor is it practical from an engineering standpoint to reduce the noise produced. Regulations, therefore, should not apply to equipment in use, but only to equipment produced after a specific date.

We are advised that the technology exists to reduce noise levels on construction equipment. Some equipment—air compressors, for example—have been so redesigned. Until uniform standards and requirements are developed, manufacturers cannot produce and contractors will not have available to them equipment with reduced noise levels.

In any consideration of measures to preserve and enhance environmental quality, the cost of such measures must be considered. Noise-abating devices are expensive, as are protective devices worn by construction personnel. We repeat that regulations must be reasonable and uniformly applied, so that all operate under the same conditions and everyone is aware of the additional costs involved.

We commend the wording of the proposed Noise Control Act of 1971, which states in section 6, "Noise Generating Standards":

"(a) If the Administrator, in a report published pursuant to Section 5, identifies as a major source of noise any product or class of products of one or more of the following types:

"(1) construction equipment,

"(2) transportation equipment (including recreational vehicles and related equipment), or

"(3) equipment powered by internal combustion engines,

he may, after consultation to the extent desirable with appropriate Federal departments and agencies, by regulation prescribe and amend standards limiting the noise-generation characteristics (including reasonable durability over the life of the product) of such product or class of products.

"The standards so prescribed shall be the standards that the Administrator determines, consistent with criteria published pursuant to Section 5, to be requisite to protect the public health and welfare. In prescribing and amending such standards the Administrator shall consider whether any proposed standard is economically reasonable, technologically practicable, and appropriate for the particular products to which it will apply, and whether the particular products can more effectively be controlled through Federal regulation of interstate commerce or through State or local regulations. Provided, that no standards prescribed under this section shall apply to products manufactured on or before the effective date of such standards."

If standards are developed as described above using representation of all facets of the industry, we should be able to comply with the proposed regulations. We highly recommend a consensus standard.

We are concerned about the possibility of conflict. Therefore, all existing safety standards should be carefully considered. We already have the Walsh-Healey Act, the Occupational Safety and Health Act, and the Construction Safety Act. We urge that any new standards developed be not in conflict, such as I mentioned earlier, where the required backup warning device develops an unacceptably high level of sound.

The regulations under the Occupational Safety and Health Act will become effective on August 27. These regulations specify that noise levels must either be held below a particular level or that protective equipment must be supplied to the workers. The contractor has full responsibility to see that these regulations are complied with and is subject to severe penalties if they are not.

The Occupational Health and Safety Act does not require manufacturers to produce less noisy equipment, and it does not penalize workers who refuse protective devices. The contractor is caught squarely in the middle and is made responsible for situations over which he has little control.

The present legislation being considered by the House Interstate and Foreign Commerce Committee would require that the actual equipment used in construction be modified so that it complies with noise emission standards to be developed by the Environmental Protection Agency.

The House legislation contains several very practical provisions which would be of great benefit to construction contractors. The EPA is required to consider whether any proposed standard is economically reasonable, technologically practicable and appropriate for the particular products to which it will apply. The legislation also states that "no standards prescribed under this section shall apply to products manufactured on or before the effective date of such tsandards." Manufacturers are prohibited from selling equipment that does not meet the standards. The contractor would be prohibited from removing or rendering inoperative any device installed to reduce noise.

The present approach to the noise control problem seems to be far more equitable to the contractor than the requirements of the Occupational Health and Safety Act. The House bill would give the equipment manufacturers prime responsibility for producing equipment that meets noise abatement standards. The House bill does require additional language to ensure that the requirements are applied to all contractors in all segments of the industry so that any individual contractor or group of contractors would not be given an unfair competitive advantage.

Mr. Chairman, this concludes my remarks. We would be happy to answer any questions you may have.

Dr. MEYER: Thank you for a very fair statement of the horns of the dilemma upon which you are impaled. Dr. Lyons.

Dr. LYONS: To summarize your position, then, is it your position that as long as the additional costs of construction machinery now have to be borne by all people doing construction work that you don't mind this additional cost as long as all contractors are subject to having to buy this same additional equipment?

Mr. Palazzi: I think that we are saying is you ought to spell it out very definitely to make sure that the white-hatted contractors and the black-hatted contractors will be all on the same level.

If you don't spell out all environmental protection, whether it be noise or water pollution or anything else, if you don't spell it out and definitely say what you want and how it is going to be done so that all contractors would be in the same category and meet the same conditions, we can't afford to have the black-hatted ones get away and save a lot of money and drive the white-hatted ones out of business.

So, therefore, it should be spelled out and definitely referred to in every contract by the owners.

Dr. Lyons: No further questions.

Mr. Meyer: Mr. Baron.

Mr. Baron: Good to see you again.

Mr. Palazzi: Good to see you again, Mr. Baron.

Mr. Baron: I just want some clarification on the air compressors that are now redesigned—your bottom paragraph on page 2. Do you feel that it would be equitable at this time to try to get the use of the quieter air compressors—in other words, equipment that is now available?

Mr. Palazzi: I think there you have got to really spell it out. The owners have got to have it spelled out, whether it be the highway departments or building owners or whoever it may be, that it is imperative they be used. Otherwise nobody is ever going to spend that amount of money.

Mr. Baron: There should be specs in the contract, in other words?

Mr. Palazzi: That's right—spelled out very clearly.

Mr. Baron: The other question was you mentioned the only control you have available now is hours, the use of hours. Also how about siting? Can't a lot be done with siting of power plants and so on?

Mr. Palazzi: I think there is improvement on all that now to protect the plants and to better the siting and the construction of them. I think most all of our highway projects are also improved for siting and environmental protection compared to what used to happen many years ago.

Mr. Baron: I mean the siting of equipment in construction.

Mr. Palazzi: Oh, I think there is some new equipment that is better sited, although the last of our equipment isn't quite as well described because we have so many safety features on them they are not better looking by any means. But, however, they are safer—for instance, many of our pieces of equipment have fenders and exhaust manifolds that we never had before—so that they don't look as well, but they are safer.

Mr. Baron: One last question. A previous speaker mentioned the fact there was some equipment available for retrofitting some construction items. Would you really object to the use of that on existing equipment where there are packages that could be applied to we'll say an old type compressor or something?

I don't know if you heard that. You may not have heard it. Was it the gentleman from the muffler company? There are packages. I think General Motors has such a package. Delta P or Burgess have an exhaust muffler package for compressors that can go on existing compressors.

Mr. **Palazzi**: I think if it's spelled out I wouldn't be against it.

Mr. **Baron**: You mean if it's in the building spec or whatever so everybody has to meet the same standards?

Mr. **Palazzi**: That's right.

Dr. **Meyer**: Dr. Bender.

Dr. **Bender**: No questions.

Dr. **Meyer**: Mr. McCarthy.

Mr. **McCarthy**: As an association is it practical for you to, say, join with governments at all levels to help make a market for the type of equipment that you are saying you would buy if it were available?

Mr. **Palazzi**: What we are saying is we will do everything we can to help protect the environment if it's spelled out and made understandable to everyone. We want it to be fair, and we want you to understand it's going to be costly, but, however, they are not against doing it.

Mr. **McCarthy**: I understand that. Are you saying that this is the government's responsibility to spell this out?

Mr. **Palazzi**: On the government or the owners of the projects. The government doesn't own all the power projects, for instance, or the building projects. It must be spelled out by the owners.

Dr. **Meyer**: Dr. Okun.

Dr. **Okun**: How can you get the owners to spell something out? They are all individuals. Doesn't this then require some kind of State or national legislation?

Mr. **Palazzi**: Well, that's one way of doing it, yes.

Dr. **Okun**: What other way would you get an owner to specify this? He has no interest in the noise that is generated during construction of his project. He is only interested in it when he is finished.

Mr. **Palazzi**: Maybe you can get the architects to accept that responsibility as a group.

Dr. **Okun**: I have a specific question. I infer from your statement that you feel that the standards and the specifications for improved noise control should rest with the equipment manufacturers and not with the contractors. In other words, the contractors are only liable as the equipment is available. Does this mean that you don't believe that there should be any standards for the construction industry as an industry, that as long as they buy the equipment that is on the market that they are home free? Is that the idea?

Mr. **Palazzi**: No, I think what I'm saying is that it's up to you or the government agencies to insist that the manufacturers have something that is available. The contractors won't be able to build it or to promote it if it's not available.

Dr. **Okun**: Yes, but if the equipment is available there may still be quite a difference in performance between various contractors in noise production. Some contractors may assemble a lot more equipment than necessary to get a job done more quickly and they put their equipment at a place where it interferes more than other might.

In other words, the equipment itself is not the only aspect of noise production on the construction site. Don't you feel that there would be some value in regulations governing contractors in their construction work?

Mr. Palazzi: I think this is very important. I also think it's very important, for instance, to regulate what hours the job is going to be run to take care of noise too.

Our own company for years has built highway projects in hotel areas, especially in the country, and we never allow them to start before eight o'clock in the moring. Some of our competition will start their jobs at seven.

So that's why it should be spelled out in the contract when it is let what time they should have it and what regulations there should be.

Dr. Okun: But this then is an obligation of the government, because if it costs the owner more to limit the hours of construction, which it will, then he is not apt to want to do it unless he is required to do this by government.

Mr. Palazzi: By the same token, I live in a city where the city itself starts cleaning up and maintaining their streets and cleaning up all the rubbish at seven o'clock in the morning, you see, so you have got to be safe all the way around. If you want us to start, us constructors to start, at eight, you shouldn't be starting your city project at seven.

Dr. Okun: One last question. Do you feel that the same noise levels should be maintained at projects within the city and in a rural area, for example?

Mr. Palazzi: Well, if there aren't any people around the rural area, I think probably you could release some of the regulations if they get the cost down and save a lot of public money. I would think that would help.

I definitely think in a city you should take better regulations. But if there isn't anybody bothering out in the country, then I don't think you should be so strict.

Dr. Okun: But your approach, which would put specifications on the equipment which would make it all uniform, wouldn't this tend to require that this equipment is the only equipment to be available and would have to be used then in the isolated areas whether it was necessary or not?

Mr. Palazzi: I think that will happen in time anyway. I think you will see many improvements on equipment, and even some of the old equipment will be improved. But I'm sure that the new equipment will be a general thing in a few years

Dr. Meyer: Thank you very much, sir. Actually much of what has been said here is going to be of considerable importance to us in our work, assuming some of the legislation that you have endorsed is enacted, in dealing with development of model laws and model ordinances and working with the industry toward that end. I found what you said to be very useful. I appreciate it very much, sir.

Mr. Palazzi: Thank you very much. I just want to mention that I hope we don't go into all other areas of pollution abatement but really concentrate on some of the sewage in our waters to eliminate our pollution there, because that's one of our biggest problems as far as the environment goes, and I hope we don't go off on all others. Thank you.

Dr. MEYER: Thank you. Since we have had some discussions as to who is doing what to whom in controlling noise associated with construction equipment, I would like to get back to some of the producers of this equipment and ask Mr. Lyle Munson of the Quincy Compressor Division of Colt Industries to come forward. He has been very patient. And I apologize, sir, for the fact that, like most technical, professional, and business meetings, as well as public hearings, we do get behind. I apologize to you and other gentlemen who are patiently waiting, and I appreciate your patience.

STATEMENT OF LYLE G. MUNSON, DIRECTOR OF ENGINEERING, COLT INDUSTRIES, QUINCY COMPRESSOR DIVISION

Mr. MUNSON: Thank you.

Mr. Chairman, members of the panel, ladies and gentlemen in the audience, I would like to preface my report here in saying that we as manufacturers of construction equipment are interested in reducing the noise level. We have been spending money at it. But the name of the game today is to protect your cash flow, and so we are somewhat reluctant to spend capital dollars putting it in inventory, putting it in new equipment, and have it stand in the yard.

So what we need from you is we need legislation, and I think it has to come out of the government.

I would daresay today that any municipal bid we would make on a small compressor wouldn't have any noise level restriction at all. So it doesn't merit us to put those dollars into capital investment at this time until such legislation and until we are all quoting the same thing is put in effect.

So, getting into my report, I tried to simplify things because I understand these things are going into the records. And so owing to the complexity and the standard of measure for noise I believe it important to try to put the decibel in a light that may be better understood, such that you may better appreciate the problems of the manufacturers of construction equipment.

Zero decibels was set at the threshold of hearing, and the relative energy striking the ear at this point is to be considered at 1. As the noise increases, the relative energy increases such that if the decibel reading increased to 50, which is normal conversation at 3 feet, the relative energy will have increased 100,000 times. And if the noise level increased to 100 decibels, which is similar to a 200-horsepower diesel at full power at 3 feet, the relative energy will have increased 10 billion times.

I point this out because it is the relative magnitude of energy for each decibel in the sound pressure range we are operating that concerns us, and so it is important from a practical and economical viewpoint that any decibel standard that may be set not be rounded off to some convenient number. And I heard it bandied around today. We talked 90, we talked 85, and we talked 80. And thus the reason bringing out this magnitude.

Another descriptive means of explaining the magnitude of the decibel would be to consider that 90 dB(A) is twice as loud to the ear as 80 dB(A) and four times as loud as 70 dB(A).

It is also proposed that the sound measurements be related to the "A" weighted scale of a sound level meter such that the requirements are stated in dB(A), the reason being that each of the three weighted scales—namely, A, B, and C—on a sound level meter responds more to some frequencies than to others, with a selectivity something like the human ear, and it is the "A" weighted scale that most nearly matches the human ear.

The normal human ear can detect virbrations from 25 to 15,000 cycles per second, but the frequencies that usually cause hearing damage are between 1,000 and 7,000 cycles per second. It is in this range that the "A" weighted network has the best response, and it is in this frequency range that money for silencing is best spent.

We as a manufacturer of portable air compressors have targeted on 85 dB(A) at 3 feet at any point around the compressor. To reach this point we have concluded that our manufacturing costs will increase 15 to 20 percent, not to mention the current tooling and manufacturing techniques that will have to be discarded.

We reached this and other conclusions based on our engineering development work in which we achieved a level of 87 dB(A) at 3 feet with a 600 c.f.m. compressor driven by a 200-horsepower diesel engine. And I might say this compressor is a helical screw compressor, not a piston type or reciprocating type compressor.

We found it increasingly more difficult and expensive to achieve a lowering of 1 decibel as we approached 85 dB(A). I feel it impractical to set any standard below 87 dB(A) at 3 feet because even though it is achieved in engineering it will be too much to expect of a production assembly line, and I also wonder what is going to happen when you have got this well put together piece of equipment and you are to incorporate it across the quarry or through some construction site. I can see this thing loosening up and you're going to pick up some noise level there. I'm not sure what is going to happen after this piece of equipment has been in the field for two years.

So we feel that 87 would be a realistic number.

It is difficult to predict what the noise level will be around the compressor at 25 feet and 50 feet, but from testing and doing a little researching while we were working on this program I believe the maximum noise level would be 82 dB(A) at 25 feet and 77 dB(A) at 50 feet.

In regard to implementing the changes required into production, starting from the time of concept in engineering to the first production unit from manufacturing, the elapsed time is 12 to 14 months. However, the compressor industry has been working on the noise problems, and most of us will have—or have—models available by January of 1972.

The only practical method of absorbing or containing noise within a portable type unit is to completely enclose it in a special structure that incorporates sound insulation material, stiffeners, and baffles. This package must be of a size that can be transported on highways. As a result of these requirements other problems are created, such as a reevaluation of the frame structure and axle loads.

Some major problems exist, such as supplying fresh air to the internal combustion engine, removing the exhaust gases, and removing and discharging the heat from within the enclosure.

The lower the required noise level goal, the more complex the enclosure becomes, until it reaches a point where it would be impracticable to move, not to mention the cost.

Unfortunately, the problems in the compressor industry are due to the internal combustion engines driving them, and if new developments in power plants become available it is conceivable that lower noise level standards can be established.

As an example, a diesel-driven 600 c.f.m. compressor without any sound level treatment will range from 101 dB(A) to 109 dB(A) in the industry, where the compressor alone is at 90 dB(A).

It should also be pointed out at this time that the methods and equipment of measuring noise must be very clearly defined such as where the microphones should be placed, the surface on which the unit being tested should rest, etc. I realize that this will be covered in another session, but it is extremely important that the test equipment and method of test be very exactly specified.

In summarizing, I would like to say that owing to the intensity of the noise encountered by driving a compressor with an internal combustion engine, it is not practical nor economical to establish a noise level below 87 dB(A) at 3 feet for a portable unit. The total time to implement such a program from the time of concept to the first production unit is between 12 and 14 months.

Dr. **Meyer**: Thank you very much. I think this was a very useful statement of how you see the problem, and I am sure several of the panelists will have some questions as to what you are proposing here. Dr. Okun.

Dr. **Okun**: Do you feel that the most appropriate standards to be established by government would be for the equipment or for the contractors who are going to employ the equipment?

In other words, if you feel that you can turn out a compressor with 87 dB(A) and a competitor perhaps 90 and another 85, if the contractor is required to maintain a certain level at a certain distance from his site, he can then choose what is most appropriate and not have to conform to any specific requirement.

What is your feeling about where the requirement should be set?

Mr. **Munson**: That is a difficult question to answer because from an engineering point of view we have to establish some level as to which to test against, and we will probably go into the field and pour a slab and test our unit, and now it becomes a problem of the individual user on how he is going to place that equipment.

I think there has to be a marriage. And, of course, the end result is where the legislation has to take place. It will have to be with the contractor or whoever bids the job in the city. I think it will be up to us to get it low enough so that he can work with it, but there has got to be some technical knowledge on taking that and putting it in between buildings, if you will, to keep that noise level down.

Dr. **Okun**: Thank you.

Dr. **Meyer**: Mr. McCarthy.

Mr. **McCarthy**: Do I understand you to differ with an earlier speaker who said that he thought that 85 dB(A) was relatively easily achieved?

Mr. **Munson**: Well, it's not so difficult to achieve. It's just that it becomes more expensive and it becomes large to the point I don't know really right now where we run out of being portable any more, for instance, if you were to carry it all away.

The statement was also made that we could go to ambient conditions, let's say, but what we are really talking about then, and maybe this is an approach you should consider, is that maybe there should be a portable structure that can be built around a unit that isn't going to be moved.

For instance, if it's going to sit on a street in New York and it's going to sit there for a year, it may be more practicable to put a building around that that is very portable. And I think by working it that way it would be more difficult than some of the approaches we are trying to take where we are trying to put it on wheels where it can be moved around.

Mr. McCarthy: Thank you.

Dr. Meyer: Dr. Bender.

Dr. Bender: Why is your company investing money in developing a quieter compressor?

Mr. Munson: Why is it?

Dr. Bender: Yes.

Mr. Munson: Well, we're sure that that's the way legislation is going to go, although it has been slow. But we are only being prepared to go. We have bought all the latest equipment in noise-measuring equipment. We have done as much development work as we need to do now to build the unit. And we are building our first what we call preproduction model. But I don't know if we'll really spend this money that is so dear to all of us companies right now unless there is legislation there. Because why should you when you know that unit is going to sit in your storage lot or something and not move?

There is no requirement for it so why put your dollars there that you can invest somewhere else?

Dr. Bender: So there is no real marketplace demand for quieter compressors?

Mr. Munson: Not really. There is a lot of rhetoric and you can read a lot, but there is really no demand.

Dr. Meyer: Mr. Baron.

Mr. Baron: There is some demand, not as much as we'd like to see. For example, in New York a hospital asked for quieter compressors. The transit authority asked for quieter compressors. I think Mr. Diehl if he could be called back would reveal it is coming without legislation but is already here.

Mr. Munson: It will be interesting to see. Because you were talking about a hydraulic unit, and our company now has licensed with France to build this unit, and we are going on a 6-month basis to see, well, if there is a market there.

Mr. Baron: Is that the Hydrovil?

Mr. Munson: That's Hydrovil.

Mr. Baron: As I say, it's not as big a market as there should be, but there is a market, and apparently a slowly growing market. And we in the public area are trying to, without legislation, increase that market, especially in terms of noise-sensitive areas.

Mr. Munson: Well, I believe you can build any product and you will find maybe 1 percent of the people that will buy it regardless of what it is. But you're not really going to move anything until you legislate.

Mr. Baron: And I would like to point out the context in which this hearing is taking place, which is environmental protection.

Mr. Munson: Right.

Mr. Baron: And, therefore, we are trying to develop on all of our parts a new attitude toward the environment. And as I repeated before, this traditional dollar interpretation is being changed, and the public is beginning to realize that it is paying part of the cost of noisy equipment, and this kind of thinking is growing in the public area.

When you say 87 I am just wondering why you feel so strongly that 87 is practicable when we already have apparently 85 on the market.

Mr. Munson: The reason I said 87 is because I know of the problems as we have started off from 102 dB(A) to get to where we are now, and to squeeze these next couple of dB(A) it's going to mean more sound traps and more insulation. It becomes increasingly more complex. And we'll shoot— But you see, regardless, even if we say 87 dB(A) in production, if this is going to be, this means that we still have to shoot below that because there are going to be other things happening that are going to creep up.

So if we say 85, that means we are shooting down maybe 82, 83 and then it really becomes a real problem.

Mr. Baron: Two brief questions. Atlas Copco—and I don't know what size—in Europe has made one, probably one of the the smaller ones, 70 I believe.

Mr. Munson: It's true. That's a good point. It depends upon the size you're really talking about. But I think if we are going to talk legislating portable air compressors, we have to start with the largest one on the market and say that's it.

If you were to consider dividing this and take the small unit that runs a little jackhammer around the street, I could see where we could probably get under 80.

Mr. Baron: I understand the difference between 800 and 1200 is not that great. As a matter of fact, it's a little bit easier to quiet the 1200 than it is the 800 if I understand.

Mr. Munson: I hope so. We have been working on the 600.

Mr. Baron: The other question is you mentioned something about a measuring method. Isn't the CAGI measuring method accepted?

Mr. Munson: That's right. If you're going to accept it we think it's an excellent measure. It's accepted in Europe, of coure, and there are some improvements being made to it.

Mr. Baron: And do you think that the cost can come down? You mentioned 25 to 30 percent. We heard one 10 percent increase mentioned earlier. Do you see—

Mr. Munson: You mean cost as far as—

Mr. Baron: Of a quieter model.

Mr. Munson: Well, 15 to 20 is what we are talking about. I said 15 to 20, didn't I?

Mr. Baron: Do you see that coming down eventually?

Mr. Munson: It's possible because, you see, we really haven't put it into production, and until we really get into production—

Mr. Baron: You don't know?

Mr. Munson: —we don't really know. But if we were to say 10 percent as has been said, then our sales department would be out selling it and we might not make it. So we as engineers are rather conservative, and it becomes a significant factor because, you know, you are really talking about compressors running from $6,000 to $50,000 a unit.

Mr. BARON: Do you believe that a quieter power plant would be something you'd like to see?

Mr. MUNSON: Absolutely. Absolutely. Because if we started at 90 dB(A)— And I gave you the figure 90 dB(A), but remember we were driving that with an electric motor so the electric motor was contributing something to that dB(A) level also.

There is no question in my mind, because we know how easy it is to silence an industrial unit with an electiric motor drive. Very easy.

Mr. BARON: Do you use electric motors in city streets?

Mr. MUNSON: No, we don't. We haven't built any for the city streets. But the biggest market Quincy Compressor serves is the industrial plants, and it's the only place that we really see where today we quote a noise level spec. I don't know if it means anything, but one of the requirements in a spec that we quote today is: What is your noise level? Is it below 90 normally? And sometimes 85. But we have no problem of getting down below 80 with an electric motor drive.

Mr. BARON: I'd like to say in Zurich I did see electric compressors in use and apparently they are available on skids in the United States.

Mr. MUNSON: Right. And if somebody requested one we would have no problem of putting it on wheels and making it a portable type unit.

Dr. MEYER: Professor Lyons, this is your bailiwick.

Dr. LYONS: You said your company had spent considerable money developing an acoustics laboratory, acoustics design capability. When did this become significant? Two years ago? This year? Or when?

Mr. MUNSON: Well, I would say we proposed to the corporate office it will be two years ago this September, but actually the work that has really taken place in developing, working on a noise control has only been a little over a year now, and we really haven't pushed it very hard. We could have pushed it faster, but there is no real demand for it. We could find other places even in engineering where we'd rather put our talent than working on noise.

Dr. LYONS: No other questions.

Dr. MEYER: Thank you very much, sir. I appreciate your candid remarks there at the end. I would now like to ask another equipment manufacturer, Mr. Rodger Ringham, of International Harvester, to come forward.

Again, sir, I realize we are running about an hour behind, but we are catching up. And we are not really trying to run a race here, we want to get as much of this information into the record as we can, because we are getting some diverse views that are very valuable to us. Mr. Ringham, we're glad to have you with us, sir.

STATEMENT OF R. F. RINGHAM, VICE-PRESIDENT, ENGINEERING, AND J. R. PROSEK, CHIEF ENGINEER, CHASSIS TEST CONSTRUCTION EQUIPMENT DIVISION, INTERNATIONAL HARVESER COMPANY

Mr. RINGHAM: Dr. Meyer, panelists, ladies and gentlemen, I guess we have the distinction of being the first "Huntley-Brinkley" team here anyway. I would like to introduce the other half of the team, Mr. John Prosek, who is the Chief Engineer in our Construction Equipment Division involving chassis test, and our function includes the acoustic testing and development work.

You do have a copy of our text. We are going to take the liberty, however, of diverting from it—one, in the interest of time, and, two, in the interest of responding to the context which we have seen developed this morning.

Dr. **Meyer**: Very good. Thank you very much.

Mr. **Ringham**: A brief summary of International Harvester Company's experience in the area of sound measurement and control is being presented. More specifically, we will discuss our activity in this field as it relates to the construction industry, and we expect to appear before you at other hearings for other parts of our work .

Dr. **Meyer**: For which we shall be extremely grateful. We appreciate it very much.

Mr. **Ringham**: In the construction market our activities include heavy equipment made by the Construction Equipment and Hough Divisions, light industrial equipment by our Farm Equipment Division, and off-highway and on-highway trucks of the construction type made in our Motor Truck Division. So we are here as spokesmen for four facets of our operation, each of which is more or less an autonomous operation. Therefore, you are getting a consensus statement from us rather than a singular statement from just John's division.

One thing I think has been pretty clearly brought out in these hearings to date, which is the fact that the whole acoustics field is multidisciplinary. And when you get to the vehicle, we have introduced more disciplines. The human factors aspect of the operator, his requirements, his need for vision, for safety, etc., are all factors that we have to deal with in addition to the normal mechanical engineering to make the product work.

We also get involved through the operator then in many safety facets such as vision, etc., that have to be considered and that offer new restraints over certain other classes of equipment that we have heard about today.

So our activity is primarily in the phases of earthmoving and hauling, and that is, of course, what we will be discussing then. And it's obvious that no one company or agency can singularly cover the whole field.

Now, of approximately 20 basic types of construction machines we manufacture 8 types in about 50 models and sizes. These range in power from approximately 40 horsepower to as much as 635 horsepower, in sizes up to over a quarter-million pounds in weight.

Now, these larger vehicles aren't necessarily pertinent to the general construction field. They are oftentimes special. So that we won't be talking quite up to those peak sizes but close to it.

John, why don't you continue the dissertation?

Mr. **Prosek**: My sound power isn't very great so I hope you can all hear me.

Mr. **Ringham**: I might interrupt a moment and ask if we can get the lights down because we will shortly have slides.

Mr. **Prosek**: I will start by telling you the basis of our sound level measurements. For those measurements relating to areas contiguous to construction sites we have been using the 50-foot Environmental Sound Level. It's a term we coined, and we call it "ESL" for short. And we express it in dB(A). Actually, this is more or less outlined in the SAE standard J952b and standard J366 as applied to the motor trucks.

The 50 feet, of course, refers to the distance between the sound source and the microphone pickup. And except when we otherwise note, the sound source and all the values will be given on this basis, which is for a vehicle working 50 feet from the microphone station while it is accelerating or under load, whichever one happens to be the highest level in the rating that we obtain.

So that those of you who are not thoroughly familiar with the terminology of construction machines will understand, we would like to show you some slides of typical construction machines, and we will also show you charts of the respective and relative sound levels of the various machines we have shown.

May I have the first slide, please.

(Slides and figures are presented at the end of this statement.)

This first slide shows a typical small elevator type scraper of approximately 10 cubic yard rated capacity. Machines in this category range in horsepower from 145 to 157, and the 50-foot ESL is 84 to 86 dB(A).

Next.

Mr. Baron: ESL is equivalent to "A" or is that a modification?

Mr. Prosek: dB(A), "A" weighted scale.

Mr. Baron: It's the regular dB(A)?

Mr. Prosek: Right.

Here we have a large conventional type scraper. The horsepower range on this is 260 up to 435 horsepower, and the ESL on these goes from 90 to 94 dB(A).

Next slide, please.

A typical off-highway truck. Most common sizes are from 20-ton to 50-ton capacity and range in horsepower from 250 up to 600 horsepower, and the ESL is 84 to 88 dB(A).

Next slide, please.

Large rubber-tired front-end loaders of this type which are likely to be used on construction sites will range up to 635 horsepower. However, we do make some larger ones for special applications. Here the sound level will be about 85 to 97 dB(A), which is the spread.

We will next show a small rubber-tired loader on which the sound level ranges from 78 to 90 dB(A). Here again you note the 12 dB(A) spread.

Generally, crawler-type loaders are limited in sizes that are comparable to the smaller rubber-tired loaders which we have just shown you, and these also range from 78 to 80 dB(A).

The next one is a typical large crawler-type dozer in the 300-horsepower class. This category of machine will have a sound level of 85 to 88 dB(A).

Typical of the motor trucks which operate on construction jobs is the one shown here which you will all recognize. It ranges from 85 to 90 dB(A).

Light industrial machines such as the rubber-tired loader tractor shown are frequently used on the smaller construction sites, and their sound level ranges from 80 to 85 dB(A).

Finally, we have another light industrial type of machine on which we have had some experience, an excavator, that ranges from 78 to 80 dB(A).

Now, if I might have Figure 1, please—

—here we summarize on one chart the data which I have just shown you for each class of vehicle. You will notice that there is an indication of the sound level increasing with the size or the horsepower of the machine. However, I might note that the pattern is not exactly a straight-line pattern.

In Figure 2 we show you the same information on a bar chart which brings out a little more clearly the relation between size and dB levels expected. And I would like to remind you at this time what we're taking is levels of 50 feet.

These sound levels which we have shown you are fairly representative of the machines in the construction industry. Many of the larger machines currently exceed the 50-foot ESL value of 88 dB(A) recommended in SAE J952b. However, we do believe that this level is attainable in new models or by major revisions of the current models in production. Further reduction, however, is likely to be difficult and costly, particularly on the larger machines.

But I do want to point out that we are continually working on this aspect.

At this point I was going to include a little bit of material that has already been covered, so in the interest of time I will skip over this and I will ask for Figure 7—

—in which we show a breakdown of dB(A) level by major component items for a typical large construction class vehicle. We show the basic engine noise sources as we lump them together, the mechanical and combustion noises which radiate from the engine itself and, of course, the air inlet and the exhaust noises.

Now, you notice in that column on the right we show an anticipated level which we expect we can reach.

Reduction in the mechanical and combustion sound levels—that is, reduction of 4 dB(A) which we show—was achieved by enclosing the engine compartment, and I think you have heard that before. We found we could do this experimentally—however, at the expense of some cooling difficulties which were introduced.

When it comes to enclosing the engine or power plant on a crawler tractor or a large rubber-tired machine, we are not in as good a position as, say for instance, the air compressor which was shown previously. First of all, we impair the visibility of the dozer operator in the case of a crawler tractor.

In the past we have gone to great lengths to tailor the configuration of the hood so the operator can see the edge of his blade and perform his functions efficiently. And if we increase the size of this compartment tremendously, we handicap the operator.

Furthermore, we have a problem that we now have the engine compartment interfering with the tracks. Well, if we spread the tracks out, increase the tread, then, means we have to increase the size of the blade because the tracks have to stay inside the blade.

So we kind of go around on a merry-go-round on the thing.

If we increase the size of the blade, then we have to increase the size of the engine. So we have problems.

By the same token, on large rubber-tired loaders, if we in our case, most of the large sizes, have the engine in the back, we impair the visibility of the operator toward the back and make it all the more demanding for a backup alarm which again defeats the purpose of the sound control.

With reference to the 5 dB(A) reduction in intake and exhaust noise, we obtain this totally from a careful muffler development and application. The intake air filtering is usually applied—and this was brought out earlier too—and it serves pretty well as an air inlet silencer itself.

I might comment on the application of the muffler. Unless it is well worked out, we are apt to— And we have encountered customer and/or operator resistance to mufflers. We had one on a vehicle where after a certain period of time the operator said, "Take it off. I can't see."

Cooling fan improvement shown is typical of what can be done to reduce fan tip speed by increasing aerodynamic efficiency through shroud improvements, and so forth.

Now, we have listed the transmissions. As you can see, most typical transmissions operate at dB levels that are well below those of the other sound sources, and, therefore, we do not consider improvements in this particular area to be very lucrative with reference to spectator or passerby noise level. Its value lies chiefly in the operator compartment.

It is to be noted from the chart that the overall result we show is a reduction from 92 dB(A) to 88 dB(A), and we have shown here how significant reductions can be achieved in three areas—namely, basic engine, exhaust, and the fan. Such reductions will require considerable tailoring for the individual machines, particularly the larger ones. This will, of course, require some time for development and will result in increased costs.

Another point I'd like to make is that to get this kind of improvement requires that all of the indicated steps be taken. If, for example, we only took the muffler, the overall sound level would only drop to 91 dB(A). If we only made the treatment for the mechanical and combustion noises, then we would wind up at 90 dB(A). This again emphasizes the need to treat all of the important sound sources to achieve significant overall improvement.

I might say that in addition to our own in-house work our company was cosponsor of SAE Research Project R-4 conducted by the Department of Applied Physics, Southwest Research Institute. While this report was directed primarily toward noise-induced hearing damage risk for operators, it does contain considerable information about sound level characteristics of construction machinery that will prove a useful reference to your agency—this book here (indicating).

Dr. MEYER: Yes. We would like to get a copy of that if we might.

Mr. RINGHAM: We will get you one.

Mr. PROSEK: Now, in conclusion, we wish to reiterate that the possibility of retrofitting existing machines to obtain substantial reduction in sound levels is limited. I think that was brought out before too. The exception is probably in those cases where exhaust noise is dominant and a carefully selected muffler can effect a significant reduction in dB(A).

In the relatively near future we feel that an environmental sound level of 88 dB(A) at 50 feet is attainable for our class of heavy construction machinery at some cost penalty. You note the lighter industrial equipment is already well down below that. Further significant reduction will require much research and development.

Particularly with regard to engines it will likely be at a considerable cost penalty.

If specific data on any given machine would be of any use to you, we would be glad to furnish it to you on a confidential basis.

We appreciate the opportunity to present these facts to you. Thank you.

Dr. **Meyer**: Thank you very much for your observations, and we would like, of course, to have the SWRI report. I will now ask Mr. McCarthy if he has any questions that he would like to ask.

Mr. **McCarthy**: No, I will pass for now.

Dr. **Meyer**: Dr. Bender.

Dr. **Bender**: Yes. I was surprised to see that you only got 3 dB(A) of noise reduction by enclosing the engine. Can you account for that?

Mr. **Prosek**: Yes, I can qualify that. We enclosed it to the extent that we felt was practical. In other words, we didn't encapsulate the engine.

Mr. **Ringham**: Bear in mind this is based on minimum change that could be adopted at an early incorporation date, not the complete redo of the cocooning of an engine that would entail some tremendous development, not the least of which is devising ways of having sound-tight access panels where you could service and even inspect the beast that is in there and all the appurtenances that you hang onto by way of pumps or other things.

So we are trying to take a cut at what we could do for very near-term potential, and that was about the most we could do. And then we introduced some cooling problems we haven't solved yet, as John said.

Dr. **Bender**: Do you vibration-isolate the engines from the structure?

Mr. **Prosek**: Yes, we do.

Dr. **Bender**: That's all.

Mr. **Baron**: I just wanted to clarify the ESL in relation to operator position, because all of these in ESL of 88 or whatever at 50 feet would be, by rule of thumb, what? Another 10 dB(A) at 1 meter, 3 feet? Is that correct approximately? Which is above the damage risk criterion.

Of course, in some cases I didn't see cabs. But is there any concern here for the operator's position?

Mr. **Prosek**: Yes. As a matter of fact, most of our work was slanted in that direction on the construction equipment, and the cab is one facet of that investigation.

Now, we have a relationship, and it will vary, oh, possibly 6 or 8 dB(A) from one machine to another, so we can relate or correlate the levels we measure at the operator's ear and what we measure at 50 feet.

Mr. **Baron**: But you do agree that they are above known damage risk criteria without some treatment of the cab?

Mr. **Prosek**: There is no question about it.

Mr. **Baron**: The other thing is that the SAE 50 feet is disturbing in an urban environment because it's difficult to find that 50 feet or 100 feet actually for test measurement. And I was wondering how you feel about 21 feet, you know, or something like that, as well as 50, for the measurement position.

Mr. **Ringham**: I think perhaps the best way to express our interest in holding to 50 feet is that that is a pretty conventional and accepted standard for highway vehicles. And we are at least—maybe we're selfish about it—but we're in the realm where we are in the interface between the highway and the construction site through our constructor trucks, and we have tried to keep a common denominator here to be able to feed technology between our divisions.

So the communication problem gets to be pretty significant if you start having several different standards depending upon what you're talking about. At least we have sure found that internally, and I can imagine the world to be a lot worse.

Mr. **Baron**: I would like to point out in terms of the urban area there is a lot of discussion—and I don't know what final action will take place—about a 21-foot or something like that measurement position, that many of us feel that the 50 feet is very unrealistic as far as the urban environment is concerned.

Mr. **Ringham**: Well, as a matter of fact, it wouldn't really bother us. It's just what you're getting is what we have been working with. We have done some work at 21. That is also pretty popular in Europe. Or close to it. And as a result we can go any way that someone wants to legislate. It's just that the first things that were imposed on us were passing noise requirements from the State of California related to 50 feet, and we have to be responsive when legislation is telling us what we have to produce.

Mr. **Baron**: Is this where most of the direction is here—for the California—

Mr. **Ringham**: The truck work began with that orientation. It got to be a standard in our Truck Division. And since that was a legislated response item, we standardized in our company on 50 feet just to have a common denominator so we could compare apples and apples. And it is getting a little bit away from some of the very near-field effects where you can get all screwed up from local masking, from whatever may be around an operator, for example. Admittedly it's not perfect. In going around the vehicle you get quite a variation at 50 feet. But at least it does get away from extreme local spikes that you get much closer.

Mr. **Baron**: As far as the long range is concerned, do you feel you will be able to do something as far as the operator's position which would also we hope benefit the environment?

Mr. **Ringham**: We not only can do, we have done. For even our largest equipment we have cabs that not only have acoustical control but rollover protection integrated into them.

The large front-end loaders, for example, the one I mentioned that is often a quarter-million pounds, a very special item. But it has a fully integrated acoustic and roll-over-protected cab. You have to be careful how you tie a rollover protection and a cab together or one feeds the other and the cab collapses on rollover and that endangers the operator, or the structure conducts sound up from the transmission or some other place and rattles the operator.

Mr. Baron: In the long range do you see a further reduction in some of these ESLs?

Mr. Ringham: Oh, sure, in the long range. That's where we emphasize the long-range importance of the engine development, in that it is a source that is now getting to be the dominant source, the mechanical and combustion, when you go to sufficient muffling, which obviously as John pointed out a lot of people don't like because the muffler usually ends up where you can't see in a lot of vehicles, because you can't put it down where it's out of the way because then it gets damaged by debris.

Mr. Baron: Thank you.

Dr. Meyer: Professor Lyons.

Dr. Lyons: As I take it, you said that you today could quiet a typical vehicle from 92 overall to 88 overall?

Mr. Prosek: Right.

Dr. Lyons: This doesn't require any new technological breakthroughs. You could do that if you had a customer. Do you think you will have any customers?

Mr. Ringham: We will probably get the customers when we get the regulation, because it's going to cost money, and we obviously aren't going to sell the vehicle if we add the price on and our competition isn't forced to the same standards.

Dr. Lyons: So you reiterate a point made by some people today that the construction industry, the buyer of these vehicles, will not buy quieter vehicles unlesss forced to do so?

Mr. Ringham: Yes. And I believe that has been pretty clearly stated by predecessors at this seat, representatives of the construction industry as well as others. And I think that is very true.

This leads me to want to relate a little anecdote. One of our competitive friends in the farm equipment business decided it would be nice as a public relations device to give away a lot of rollover-protection structures. And I can't remember the numbers now, but a very significant percentage of those came back with a request to trade it for something more useful.

So if the user isn't interested enough in his own environment to worry about rolling the whole thing over on him—and that happens with unfortunate frequency in the farm industry—surely he isn't going to be very concerned about a more passive thing like progressive and gradual hearing damage.

Mr. Baron: Just one more question. When you use the word "user" is there also concern—you use the word in environmental sound level—for the environment which you're working in today? Again I'm thinking of the urban environment where this becomes more acute. These figures are pretty high at 50 feet. Somebody could be getting up on the sidewalk or closer which means adding another 10 dB or more.

Mr. Ringham: Please bear in mind the large numbers we are talking about are in the very heavy machines. You may remember—we went through it pretty fast—but the bar chart, I believe Figure 2, highlights the fact that lighter vehicles are much quieter. They inherently have smaller power and smaller accessory drives and other things to create the noise. It's easier to put a quieter fan on them.

Dr. Meyer: Dr. Okun.

Dr. Okun: Is there a difference in noise production based upon the skill or the interest of the operator of the vehicle? Can an operator if he doesn't care produce more noise? We know this is the case with some vehicles.

Mr. Prosek: Well, yes, in some cases.

Now, in the case of a crawler tractor generally the operator doesn't have much control over making a lot of excess noise because he operates at wide-open throttle for the most part. Now, on trucks—and particularly I have noticed this in quarry operations—the driver seems to get quite a kick out of racing the engine as they pull away from the crusher, and it gives them a feeling of power.

And one peculiar trait of the operators is they do in a sense judge the loading on their machine by the sound of the engine, and this is one reason why they object to mufflers.

Dr. Okun: Is there any kind of direction or control of operator behavior with these vehicles? Is this something that ought to be looked at at all? Or do you think the job is done when the machine is purchased?

Mr. Prosek: You mean as far as operator training?

Dr. Okun: Operator training or operator surveillance. There is also the problem of maintenance of the vehicle. I presume once the owner has it and he doesn't maintain it properly, the noise levels may go up gradually so two years later the noise level may not bear any resemblance to what you produced. Is there any kind of regulation of this sort of thing that would be appropriate?

Mr. Prosek: There is no regulation at the present time.

Dr. Okun: I know, but what would you suggest would be appropriate?

Mr. Ringham: Let me try that. I think the only thing that could come to mind offhand is something either the operator or perhaps the job supervisor has some control over, and that is a tight grouping of vehicles to get a higher point-source equivalent from a multitude of vehicles. If you keep them spread out on a job site you're probably more likely to less affect some particular spot in the range of the job.

But that's a pretty broad generality and doesn't really give anything but a "motherhood and sin" statement.

I can't think of a specific, concrete thing other than, as John suggested, avoid the hot-rodding at least, and the guys that are heavy-footed on the throttle sit and buzz it. But even those are things that are hard to typify in a regulation that says "thou shalt not do this."

Dr. Meyer: First, we have a minor environmental crisis apparently within the hotel. I am informed that there is a small water leak back in the exit to my left, to your right, which is near an electrical outlet, so you are requested to use the safer exit route more environmentally acceptable on this side. Then I have a question a member of the audience has asked that I address to you, sir. Then we shall move along to the next witness.

You mentioned ranges of noise levels of these various different pieces of equipment as measuring your ESL at 50 feet. Mr. White, who is from the Environmental Management Division of Fort Benning, Georgia, requests that I ask you to say if the range of revolutions per minute for each engine was taken into account in this. Is this an average over idle to max or is this 50-percent power or what? And I think it's a very good point.

Mr. **Prosek**: These are wide-open throttle readings. And the range comes in the fact that we are not referring to one particular machine. We are referring to a group of machines within a fairly wide category. In other words, they may range considerably in horsepower, and the engine speed, their rated speed, may vary, but they are all measurements at wide-open throttle.

Dr. **Meyer**: Thank you very much.

Mr. **Ringham**: I might also add that it is also spread considerably by the fact that there is more than one kind of engine in some of the models, more than one manufacturer's. Sometimes ours. Sometimes other people.

Dr. **Meyer**: Thank you very much, sir. I think this was a very illuminating discussion, particularly with regard to the measurements that you have actually made.

(Copies of the slides used in the International Harvester presentation follow:)

Dr. **Meyer**: We would like now to hear from another producer of equipment, namely, Caterpillar Tractor Company, represented by Mr. J. Hasten. The members of the panel have suggested that perhaps a leg-stretching break might be in order. If you will indulge us, gentlemen, we will take about a 2-minute rest pause.

(Whereupon, a brief recess was taken.)

Dr. **Meyer**: Ladies and gentlemen, let us get underway again. I believe we have a quorum of our panel. In fact, we have all of them. We will now continue with the presentation and ask our friends from Caterpillar to proceed.

STATEMENT OF JACK HASTEN, MANAGER, PRODUCTS CONTROL DEPARTMENT, AND LESTER BERGSTEN, STAFF RESEARCH ENGINEER, CATERPILLAR TRACTOR COMPANY

Mr. **Hasten**: Thank you, Mr. Chairman.

My name is Jack Hasten. I am Manager of the Products Control Department of Caterpillar Tractor Company, with headquarters at Peoria, Illinois.

Here with me is Les Bergsten, Staff Research Engineer, who is in charge of most of Caterpillar's noise program.

First of all, Caterpillar is pleased to have been invited to appear before this panel today. We are anxious to be of whatever assistance we can to the EPA as it undertakes the very difficult assignment of studying the broad, general subject of noise levels adjacent to construction activity.

In the interest of time, I am going to only touch on the highlights of a much more thorough treatment of this subject. Eight copies of our complete submission are in your hands, and it is our sincere hope that each of you will find time to read the entire booklet. My oral remarks are included as Appendix U. It's in the back of that submission.

Dr. **Meyer**: The entire booklet will be included in the record.*

Mr. **Hasten**: While Caterpillar has tried to design and build "quiet" machines for many, many years, these efforts were greatly intensified in the middle 1960's. At that time, specific criteria were established by Caterpillar as design objectives for noise suppression equipment for all of its machines.

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* This material is on file at the Office of Noise Abatement and Control.

The criteria established were that noise levels would not exceed 90 dB(A) at the operator's station and 85 dB(A) at a distance of 50 feet from the machine.

In order to give our engineers a specific yardstick to measure performance against, test conditions were established under which these criteria had to be met. These were:

1. Engine at full throttle, transmission in neutral.
2. Engine at full throttle, transmission engaged, brakes applied to create a condition of torque converter stall.

Notice that under both of these test conditions the machine is stationary. It was felt that noise levels generated at the operator's station, and at a distance of 50 feet from the machines, would not be significantly greater under normal machine operating conditions than under the stationary test conditions.

I'm sure it is not necessary for me to tell experts such as yourselves that noise suppression on machines such as we build is more of an art than a science. While we have learned much in this area over the past several years, perhaps one of the most significant things we have learned is how much remains to be learned.

Ideally, machine noise should be reduced by either eliminating or reducing obnoxious noises at their points of origin. In other words, design and build quieter engines, transmissions, hydraulic systems, etc. This approach, however, requires advances in the state of the art of noise reduction beyond our reach today and is not the sort of improvement which comes quickly.

Because of this, the main approach used during our noise reduction program has been one of enclosure and containment. The transmission path of the noise is being blocked, as opposed to reducing the level of noise being generated at its source.

I would like to describe for you the results of the work done on only one of our machines so that you may more fully understand the status of our program today and our current perception of what is required in the immediate future. The model I would like to discuss is the Series H D8 tractor.

Today's production D8 tractor with no noise suppression attachments was checked under the stationary test conditions earlier described. The noise level measured at the operator's station on this production machine was 96.5 dB(A). And at a distance of 50 feet from the machine, a level of 80.5 dB(A) was measured.

A noise suppression package was developed for the D8 which reduced the noise level at the operator's station to 89.5 dB(A) and to 75.5 dB(A) at a distance of 50 feet, both of these within Caterpillar's design objectives. Keep in mind that these results were achieved under the two conditions earlier described, with the tractor stationary.

We have provided photographs of all of the major elements of this noise suppression package for the D8 in the booklets provided to you, and these are in Appendices D through J.

Some of the major modifications required were the addition of a large, wrapped muffler, louvered engine compartment enclosures, hydraulic tank cover, engine isolation mounts, a larger diameter, slower speed engine cooling fan, and special sandwich-type floor plates. Over 10,000 engineering design hours were required, and some 4,000 man-hours were consumed in manufacturing a single set of prototype parts.

Shortly after this initial development work was completed on the D8 tractor, the requirements for roll-over protective structures (ROPS) were in the process of becoming more clearly defined and more widespread in their application. As many of you are no doubt aware, the Occupational Safety and Health Act of 1970 will ultimately require ROPS on all such machines.

Recognizing the imminence of ROPS as a universal requirement, the next step in our program was to determine what effect, if any, ROPS would have on the noise level, particularly at the operator's station. An untreated Caterpillar ROPS was added to the D8 equipped with the noise suppression package earlier described. Under the stationary test conditions, this structure increased the noise level at the operator's station by approximately 5 dB(A). We then had to add noise suppression material to this ROPS structure to regain the 90 dB(A) level at the operator's station.

As noted throughout our discussion, all of this test work was done under conditions of a stationary machine. Once the design objectives had been met for both operator and spectator requirements under these conditions, we then proceeded to attempt to validate the original assumption that the noise level of our machines at work would not be significantly greater than under the stationary test conditions.

It was our original opinion that to the extent that the operator noise level might intermittently exceed 90 dB(A) with the machine at work, this would be offset by periods of lower-level exposure, such that the machine would be in compliance with the Walsh-Healey cumulative exposure criteria, without the need for operator ear protective devices.

A production D7 tractor was selected to provide this validation for crawler tractors. The D7 was equipped with a noise suppression kit and noise-suppressed ROPS, such that under the static test conditions described the design objectives were met. The tractor was then operated on a representative work cycle of bulldozing.

During this test, noise levels 6 inches from the operator's ear were measured and tape recorded. These data were reduced by measuring the amount of time the operator was subjected to various noise levels. The Walsh-Healey cumulative exposure formula was then used to determine the total time an operator could be permitted to run the machine in an 8-hour day. The results yielded an answer of 2.9 hours.

Since this was clearly not acceptable, we obviously had more work to do to meet our design objectives with respect to the operator. Also, during these same work cycle tests, noise levels 50 feet from the machine were measured as high as 92 dB(A) as compared with the 75 dB(A) achieved with the machine stationary.

Our current work is concentrated on regaining noise suppression performance such that Walsh-Healey criteria can be met without the requirement for operator ear protective devices. For certain of our machines, the only solution we see is to enclose the operator in an acoustically treated cab. These cabs must contain ROPS, since this will soon be a universal requirement.

The heavy structural elements which are a necessary part of such cabs make the noise suppression problem all the more difficult, since these are excellent mechanical transmitters of noise.

This final approach to solving the operator noise problem by enclosing him in a treated cab does little or nothing to reduce noise level for the spectator.

With this background of experience, and in the spirit of trying to be helpful, Caterpillar would like to make these recommendations:

1. Since the Occupational Safety and Health Act of 1970 and the Walsh-Healey regulations of 1969 have already established noise level criteria for the protection of operators of construction equipment, we would recommend that the Environmental Protection Agency not promulgate additional standards with respect to operators. Until it can be demonstrated that the state of the art will permit operation within these existing standards, we see no useful purpose in establishing more stringent criteria.

2. Years of medical research, military, industrial, and governmental studies preceded the establishment of the noise level criteria contained in the Walsh-Healey Act for sustained exposure by employees who spend a full 8-hour day on the job. Little or no such data are available to support recommended noise level criteria for the protection of the so-called spectator. His exposure teneds to be intermittent and randomly erratic. We would strongly recommend that research be initiated immediately to acquire and analyze relevant spectator noise data, to the end that realistic and attainable spectator noise level criteria can be established.

3. Once the appropriate research work has been completed, we would recommend that the Environmental Protection Agency establish uniform spectator noise level regulations which will be applicable nationwide. No local, State, or other Federal governmental agency should have the power to abridge, amend, or in any way supersede such regulations once established.

4. A need exists to establish uniform test procedures for the measurement of both spectator and operator noise levels once standards have been established. These test procedures must be simple, representative, and reproducible. We would recommend that this matter be pursued in such a way that, in the long run, a single Federal agency will be responsible for both the promulgation and enforcement of all noise regulations.

5. The difficulty of retrofitting noise suppression packages on construction equipment currently in the field should be very carefully considered prior to the establishment of any such requirements. Because of the extreme variety of product configuration and the evolutionary changes made to a given model over time, a tremendous amount of custom engineering and job-shop manufacturing would be required to equip such machines with noise suppression packages. It is, therefore, our recommendation that retrofit standards, if any are set, should be much less restrictive than new product standards.

6. In our opinion, the broad, general subject of noise abatement represents an enormously huge undertaking. Because of this, it is important that relative priorities be established in order that national as well as individual corporate resources can be allocated in an optimal manner. Caterpillar Tractor Company strongly rec-

ommends that regulations with respect to spectator noise level criteria for construction machinery not be applied prior to January 1, 1974. We will exert our every effort in assisting the Environmental Protection Agency in any way we can in the interim to see that these regulations are based on factual data.

Further, we pledge all of our resources which can reasonably be brought to bear on the development of products which will meet such regulations no later than January 1, 1974.

Thank you, gentlemen.

Dr. **Meyer**: Thank you much for an informative statement, along with your very thoughtful recommendations, and also I am most pleased for Mr. Ruckelshaus, the Administrator, to hear of your pledges to work along these lines. Again, before making a couple of comments or asking questions, I will ask my colleagues if they have any questions. Dr. Okun.

Dr. **Okun**: All your investigations were directed to a level of 90 dB(A) for the operator, while the concern of EPA is not with operator protection directly. It is the Walsh-Healey Act that is directed towards operator protection. And, of course, this is the responsibility of the employer of the operator and not the seller of the equipment.

How much do you expect that this 90 that might be achieved would drop with years of service? Some of your equipment I'm sure must serve for 10 years. What would happen to that equipment over that period of time? Do you still think you would meet the same criteria?

Is 90 an adequate number to shoot for if there will be a deterioration?

Mr. **Hasten**: Well, first of all, my company regards this achievement of the Walsh-Healey criteria as part of our responsibility. It's not in our opinion merely the responsibility of the buyer of the product.

While the current law places the burden on the contractor, we regard ourselves as a manufacturer to have a responsibility to supply him with equipment where the operator— As Mr. Palazzi said, he's caught in the middle of an operator who won't wear and a manufacturer who won't produce. We intend to produce.

In our fuller report here we make a reference to the limited field test experience that we have on these noise suppression kits. We have moved rather quickly in the last 3 or 4 years to experimentally arrive at these levels. The endurance life of some of the materials we're using. We point out some of the problems of service accessibility to the engine in particular. We have closed this engine in much in the same manner as the Ingersoll-Rand people did with the entire engine-air compressor package in spite of the compromises that this gives to the basic machine.

There is going to be a responsibility on the part of the contractor and his maintenance people and his operators to maintain this stuff. Obviously we're going to build the most life into it that we can, and that life will be extended as we gain more experience and develop new techniques, new materials. But without question the maintenance requirements on the noise suppression material itself, the maintenance requirements on the machine—that is, the hours to check the crankcase oil levels every day and these kinds of things—are going to cost the contractor more maintenance time.

The package as you look at it today in your booklet there looks pretty crude from the standpoint that we haven't maybe given some of the routine daily maintenance things the kind of attention they deserve. We hope longer range that these kits will provide for much improved accessibility, much improved maintenance life of the kits themselves.

One of our problems today that prevents me from standing here right now and saying we can do this right now is that, frankly, we don't know. You have to take a D8 tractor with one of these kits on it and give it to a contractor and let him run it for 2,000, 3,000, 4,000 hours under his job conditions with his maintenance people before you know those answers, and we have not done this.

Dr. OKUN: I infer from your recommendations that— Well, you actually say that you expect that the specifications or the regulations will be set on the equipment manufacturer. Is it more appropriate from the standpoint of noise control generally that it be placed on the equipment manufacturer as contrasted with being placed on the operator of the equipment or the contractor? Where do you feel that the regulations should be directed?

Mr. HASTEN: Well, we feel that we have a responsibility to deliver to that contractor equipment which will meet whatever criteria are established by regulation.

Dr. OKUN: Yes, but so far as the government, whatever agency of government establishes regulations, to whom should they be directed? Do you think they should be directed to the contractor or the equipment manufacturer?

Mr. HASTEN: As a manufacturer we feel it's our responsibility, that you have every right to ask us to sell to that contractor a machine which when new meets whatever criteria you set. And we're willing to accept that responsibility.

Dr. OKUN: Will this meet all of the public's— In other words, the public interest is in how the machine is actually operated and how it is serviced as you say and how it is actually used on the job, how many of them are used, and so on. So is it adequate for the government to only direct its regulations against the equipment manufacturer? Or should they also be directed against the contractor?

Mr. HASTEN: No, sir, I think we and the contractor are in this basket together. We don't want to see him in it alone, and I'm sure they don't want to see us in it alone I think they recognize that there are obligations on their part to maintain what we and others have sold them in a condition that will within reason— If we ship the guy something that will last 8 hours and falls apart, we haven't done our job. So we have got to give him a reasonable package and then he has got to exercise reasonable maintenance of that after it's in his hands.

In terms of numbers of machines that he applied—and mention was made earlier of the additive decibel thing when you get into some of that kind of algebra—frankly, I think this is where a lot of this research needs to be directed.

I think it's quite a different thing if a man is building a piece of interstate out in the middle of South Dakota as contrasted with right through downtown Atlanta as to what kind of criteria you might establish on this fellow in terms of the additive effect of the number of machines on that job.

We all know even if we achieve our objectives or even substantially below that, if you put 50 or 60 machines in a concentrated cut, the total effect of that is not going to be what it would be if they were 3 or 4.

So I'm sure it will involve not only requirements that the manufacturer deliver equipment that meets certain criteria but also some regulations that the user is going to have to abide by in order to get the final end result that you are shooting for. But we don't want to shirk our end of that responsibility.

Dr. OKUN: Thank you. One last question. In your work with operators in cabs, are the windows open or closed in the cabs for those measurements?

Mr. HASTEN: The windows are closed when those measurements are taken.

And you bring up a very good point, and that is that we know that right on top of this is the air conditioner. We have been doing development work on air conditioning for more years than I care to remember, and finally I would guess some 5 years ago, Les, we despaired of any commercially available air conditioning equipment that could be mounted on a piece of construction machinery that does the kind of things a D8 tractor does and live any respectable number of hours at all.

And I can tell you from personal experience there is nothing worse than to be an operator operating in this nice air conditioned, closed cab that is environmentally beautiful and all of a sudden that air conditioner quits down here in south Georgia in the middle of summer. In desperation he's going to get air in there. And if he gets noise along with it, so be it.

So we're working very hard on applying this air conditioner that we have spent a very large sum to have developed especially for our machinery. We have yet to run the full gamut here and see if we can still meet the 90 dB(A) with the acoustically treated cab with an air conditioner mounted—and it almost has to be in the roof of this cab the way all of the other things are involved. This poor guy also has to see.

And one of the things that we can do, and we are trying very hard to avoid this kind of situation, is to get so much stuff wrapped around this fellow that he no longer has the visibility he needs and we start incurring a lot of injuries, accidents on jobs caused by machine collisions that would not otherwise happen.

We're going to find I'm sure a lot of operators back in our part of the country where it's relatively flat— They have never been used to a canopy over them to protect them from rollover. Fellows have run machines for 40 years and never had one roll over. And all of a sudden we come along and say everybody has to have a rollover protective structure.

We're not against that. But many of these fellows when you wrap that around them and then a cab— Pretty soon he can't see like he used to. He's going to say, "I'd like the good old days."

So I think we have to proceed rather carefully here in this whole environmental and safety area that we do wind up when we get all done with a total on-the-job safer and environmentally more pure way of doing construction work.

Dr. Okun: Thank you.

Dr. Meyer: Mr. McCarthy.

Mr. McCarthy: I think that last statement is a very good one. Do you have from the work you have done so far any indication of the additional I assume costs, any estimate of what will be?

Mr. Hasten: The pure noise suppression kit that is contained in there on the D8 excluding the rollover-protective, acoustically treated cab, just the noise kit, that before we put ROPS on got us down to the 90 dB(A)—acoustically treated ROPS—we think will be on the order of about 3 percent additional cost to that machine.

Mr. McCarthy: Thank you.

Dr. Meyer: Dr. Bender.

Mr. Hasten: That does not include the ROPS.

Dr. Bender: I'd like to get a better feel for noise control treatment that is currently used on construction equipment. For example, is the high-quality exhaust muffler put on every single piece of equipment that is manufactured?

Mr. Hasten: We currently have mufflers standard on every machine we make except three. We are—

Dr. Bender: Except what?

Mr. Hasten: Except three models. And we are in the process—The only reason we don't have those three covered is the thing you mentioned. You said a quality muffling device. On two of these machines we have not reached the point yet where we are satisfied with the visibility loss with the muffler that gives us the proper noise reduction.

Dr. Bender: Do you use anything else like intake mufflers for engines or fan decoupling to get rid of fan noise?

Mr. Hasten: On the intake question, all of our machines are equipped today with dry type air cleaners. Those elements I believe, Les, do a fairly good job of muffling the inlet air.

Fan coupling devices, we have been kind of around the circle on that. I think we have yet to find anything that is reliable on our kind of machinery that will do a better job than pure belt driving of a fan. Our real problem in the fan area is getting fan tip speeds down to levels which, frankly, we didn't worry about 10 years ago. Fan noise wasn't regarded as a problem.

It's not a problem particularly with the operator. It is a problem with a man 75 feet in front of the machine. And this is a problem with a man 75 feet in front of the machine. And this is one of the real troublesome areas.

If you were to talk about retrofitting this complete package that you might expect us to build new in the factory and say, "Now go out and do a similar treatment to a man with a 15-year-old D8"—there's lots of those out there—and you start out telling the man, "Okay, you've got to put a bigger radiator in here a larger diameter fan, and a slower-speed fan," well, it's about like telling you to take your car and go over and get a radiator put in it that is 8 inches wider and that much larger diameter fan. And the guy looks at you and tells you, you know, "Go do it yourself."

Dr. Bender: Okay. One other question. We have heard throughout the day that noise control treatment for various pieces of equipment would increase the cost of the order of 10, sometimes 20 percent. If that were applied across the industry so that all construction equipment manufacturers had to produce somewhat more expensive equipment, would that be harmful to the industry in your opinion? Would people buy fewer pieces of equipment? Or do you think the industry wouldn't particularly get harmed at all?

Mr. **Hasten**: Boy, that's a— (Laughter). I guess I'd have to talk a little bit like the policeman did here. If the Federal Government in turn increased the allocation of highway construction funds by 10 percent so there were 10 percent more work to be done, I guess there would be no effect. But if you held the level of construction work constant and increased the cost of construction equipment by 10 percent it seems to me that the contractor would find some way to stretch the utilization of that equipment 10 percent further and our industry would suffer.

My guess is that the contractor's work done per year would suffer also, because I think in the final analysis his costs per yard of moving dirt would go up, and, again, unless there were more money allocated to move that dirt, there would be less dirt moved.

Some would argue that's good or bad, you know, my answer to that.

Dr. **Bender**: That's all.

Dr. **Meyer**: Mr. Baron.

Mr. **Baron**: Well, construction noise is considered one of the more serious noise problems especially in the urban area, and I see very strongly you recommend not much be done about spectator noise until at least 1974. What kind of proof do you want or would you like to see in setting this standard for spectator noise?

On the case of hearing for the operator you have the studies that you referred to on hearing loss—in other words, physiological damage. Do you want to see proof of physiological damage for people who are exposed to construction noise before you set standards for spectator noise, so to speak?

Mr. **Hasten**: Well, I think the thing we're thinking about here is that there are probably construction projects of the type that were discussed earlier this morning where a fleet of air compressors might sit on one block in New York City for a year. That's very untypical of our kind of equipment. The guy is usually in and off of this kind of a job in a relatively short period of time. He's usually also not working in the kind of an environment where the spectator is going to get very close.

I will tell you it's not very safe to get within 50 feet of a D8 tractor, particularly if it's working with a typical spread of machines that he's with.

So I think our plea is to say: Well, we don't know, on average, in urban or rural areas on a typical kind of a job what the spectator's exposure is, how close he comes to the machines, how long is he there. I think we'd all agree that at some level up here even an instantaneous exposure is not good. But I think our attitude would be if someone wanted to start something like tomorrow, certainly the spectator requirement should not be more severe than the operator's requirement who does indeed have to sit on that machine all day long.

What I'm suggesting is that if a spectator doesn't have to stay there all day long, at least not all of it, we should suggest that something lower than 90 dB(A) is at least physiologically a requirement.

Now, when you get into the psychological area and some of the other things that were talked about this morning, I don't know. And I would gather from the answers that some of the other people gave they don't know either.

And all we're suggesting is that some time be taken to establish what is realistic because, as others have said and I'm going to say too, this is not going to come cheap. Now, the getting down to the 90 and 85 level that I have talked about in here has taken a lot of hard work. And while the package we have here to date I have said is possibly in the 3 percent area and the total safety package might run that on up to 15 to 20 percent, the getting down that next 5 dB(A) is going to be a real, real tough problem on a machine like that D8.

If you will open up there to an early appendix, B, it just identifies some of the noise sources that emanate from a D8 tractor.

Now, again, if you get into this additive dB(A) thing we can find places on this machine that are perhaps relatively easy to lower the sound level 4 or 5 dB(A), but at 50 feet away we have done virtually nothing.

Some of the things that we have to get from our current targets down to some of the kind of numbers people talk about— Someone made mention of plastic gears. Well, we'd like to know how people would make plastic gears that would go in the transmission of a D8 tractor and work.

We do know that gears are a major component of the noise from our machines, and we are doing everything we know how to make gears that make less noise. But these are programs that are 5, maybe 10 years in their resolution. It may mean a complete revolution in gear manufacturing technology in this country before we as a manufacturer can buy a machine tool that will manufacture gears to put in a transmission for a 300-horsepower tractor that will achieve the kind of goals that some would like to see us achieve.

It's not that we don't want to and that we are not working on it. It's just that we don't know how. And we think before we are asked to say something like 70 or 65 or 75 or even 85 that we ought to know, all of us, not just Caterpillar—I think you people want to know—what does the spectator criterion really need to be.

Mr. BARON: I would like to suggest the spectator criteria should not be based necessarily on physiological damage. In the first place, 90 is 5 dB(A) above what was bruited around many years as the damage risk criteria.

I'd also like to put in the hopper the fact that nothing is being said or done about non-acoustic, non-auditory effects on men who work in that noise level, and this is going to crop up sooner or later. It already is in Europe, and it is starting here in the United States.

Mr. HASTEN: Yes, sir.

Mr. BARON: But again we're talking about quality of environment, which is an amorphous term that maybe we can't quantify, and I'm just suggesting the public is being hit by construction noise whether from highways that go next to the cities— We receive letters, incidentally, from people in small towns in the Midwest and so on who are next to highway construction. But it's also in terms of large building construction, and so on.

It was brought out earlier that areas will be going down and building up, and your type of equipment will be part of it.

I think the spectator noise will be taken a bit more seriously in the sense that you don't think only of physiological damage but of this concept which we can't quantify of quality of environment. Speech interference is one possibility, interference with rest or with sleep. Or, in fact, you might have a hospital or a school or a residence where senior citizens are. Or whatever kind of goal.

And I think it's important that you have that kind of thinking when you think of the spectator design. I think it's very important. And I think if that kind of thinking is there that there will be an end product.

But if you think only of determining through years of research physiological harm that comes from noise exposure, who knows? Maybe it will never be possible to determine physiological harm. That means we live with the noise exposures that we go through now and that in a way lead to this kind of organization and meeting.

So I would suggest that we might take another look at the concept of spectator noise, and I will be glad to talk to you about it.

Mr. HASTEN: I don't propose here that our program is to do nothing until January 1974. What I said in here was that if you have the regulations in January 1974 we will have the equipment. We will keep working with you, and as we mutually arrive at what the spectator noise level criteria should be and can be.

I don't want to overstress that point. We spend a lot of money on R & D. Every year an increasing amount of it is going into these kinds of activities. And there is a corporate awareness and desire to do this not only with our product but within our plants and within the State of Illinois, stream pollution, all these kinds of things that we are very deeply committed to.

But I don't want to mislead you here and say that we think we can accomplish some specific target in 1974 that we know ourselves— At least our best perception right now is we can't.

I'd like to stand here and say we can make 70 dB(A) 50 feet from the machine or 7 meters as the Europeans think of it. But from what we know today and the rate of progress we have made in this area and what we can project in the future and the problems we see, we don't think we can do it, and I might just as well be honest with you today as January 1 of 1974.

Dr. MEYER: Well, I think it's important to get this into the record. Certainly, in setting standards the Environmental Protection Agency is going to have to take into account a whole host of things. And one of the purposes of this series of hearings is to get information from both sides both as to the state of the art and as to what we don't know. And this question of spectator noise standards is going to be a very difficult one. It's one we intend to approach in a very workmanlike manner through a thorough exploration of all the possible modes of attack of the problem, taking into account the scientific problems associated with arriving at meaningful standards.

One thing that is sort of underlying everything that is going on here today is that we are going to have to address ourselves to some uniformly acceptable standard. We are going to work with both citizen groups and with industry.

Professor Lyons.

Dr. LYONS: No questions.

Dr. MEYER: Well, thank you very much, sir. I would only point out one other thing if I might. You have put your finger on perhaps some of the things the following speakers may also highlight. That is, we have got to keep in mind some of the fundamental physics. Several other people have said this. You know, coming from 105 down to 100 is relatively easy, but from 75 to 70 may be increasingly difficult, and so on going up the other way.

One of our colleagues uses a good example that I think some people ought to keep in mind about the increase of noise. Namely, if you have one child crying in a crib in sort of a weak voice and you measure it several feet away, maybe it's 30 dB(A). And if there were a pair of twins sort of painfully or woefully muttering, it might be about 33.

You have one motorcycle sitting out here measured 50 feet away while he's revving it up at half horsepower, half of its power, and you produce 90 dB(A). You put a second motorcycle right alongside and you have 93 dB(A). Obviously the 3 dB(A) up from the 90 is a tremendously more harmful and tremendously more significant figure than the 3 dB(A) down with the two weakly wailing infants, although some of them wail a lot higher than that I'm told.

But I think we have to keep this in mind coming back down the scale as well.

Mr. **Hasten**: Yes, sir.

Dr. **Meyer**: I appreciate everything you have said here. We look forward to working with you and your colleagues in industry. Next, I would like to ask if Mr. Pease from AMF-Beaird is here.

(No response)

If not, then Mr. Codlin from Allis-Chalmers. Are you still among those patiently on hand? Then, I am going to ask our colleagues from the State of Georgia and the City of Atlanta if they have anything further.

STATEMENT OF J. B. CODLIN, MANAGER, SPECIAL ENGINEERING ASSIGNMENTS, CONSTRUCTION MACHINERY DIVISION, ALLIS-CHALMERS CORPORATION

Mr. **Codlin**: Gentlemen of the panel and Mr. Chairman, ladies and gentlemen of the spectators, I am very happy to be here. I am J. B. Codlin, Manager of Engineering Special Assignments from the Construction Machinery Division of Allis-Chalmers Corporation of Springfield, Illinois.

You have heard from a very large percentage of the construction machinery industry, bulldozers, loaders, graders, crawler tractors, and so forth. And we hope that the remarks that I can add here will give you a further contribution to the needs of your committee.

Our Division has plants in Springfield and Deerfield, Illinois, and associated plants in Harvey, Illinois and Topeka, Kansas, which manufacture products such as crawler tractors, dozers, rippers, loaders, both rubber-tired and crawler, graders, scrapers, industrial tractors with mounted loaders, backhoes, and diesel power plants for the construction industry.

It is our policy to produce products using the most modern and effective safety and noise control engineering and technology for their development, production, and use that exists.

It is in line with and as a part of this policy that we present this statement today. We appreciate your consideration in allowing us to come before you. We feel that the development of realistic noise control standards and legislation is an important and constructive effort. It is our belief that development of such legislative standards must adhere to certain considerations. These are completeness, uniformity, and clarity. They must be repeatedly measurable and they must fully recognize the need to balance the state of the art with economic considerations and the overall benefit to be derived for the most people.

We respectfully submit the following for your consideration:

1. A brief overall look at the size and impact of the construction equipment industry.
2. What the construction equipment industry has been doing about sound control.
3. Technical problems and solutions.
4. Timing.
5. Machinery now in use.
6. A suggestion for an approach to sound control.
7. Answers to specific questions and subjects listed in the notice of hearings relating to construction equipment industry.

I would first like to identify a frame of reference relating to size and scope of the construction machinery business. Recently Mr. P. E. MacAllister, Senior Vice-President of the Associated Equipment Distributors, a nationwide trade association composed of 800 independent distributors throughout the United States, testified before a Labor Department hearing on the subject of P. L. 91-54, mentioned here several times today, and here are some facts from his testimony:

These distributors purchase equipment from manufacturers whom they represent and sell or rent to customers. They employ thousands of skilled mechanics and provide service facilities to maintain, repair, and overhaul customers' equipment both in the shop and in the field. The annual sales volume of these dealers is in the order of magnitude of 2½ billion dollars annually.

From the year 1960 through 1970, an 11-year period, approximately 519,000 units of major equipment were manufactured and sold domestically. This does not include many thousands of 4-wheel industrial and agricultural type tractors frequently used in construction. These are the machines of the heavier type.

It is estimated by AED that of this half-million units there are 462,000 units still working on the job. Their survey further suggests that an additional 100,000 units manufactured between 1955 and 1960 are still working.

If we then assume that these 562,000 units work an average of 1,500 hours per year at an hourly rate of $9.50—and that's low—the machines currently at work generate $8 billion worth of construction annually. This added to the machinery produced and sold amounts to over $10.5 billion in gross national product in homes, watersheds, schools, hospitals, highways, urban renewal, and so forth. This business affects the lives of every person in the country either directly or indirectly.

Throughout the years the competitive thrust responding to the demand of the public—and this is important—has been to produce more yards of earth moved at less cost. As a result, the cost of a yard of earth moved has increased only slightly in spite of higher labor and material costs. This requirement could be met only through increase in power and size of earth-moving equipment.

But due to basic laws of physics, chemistry, and mechanics along with increase in power and size also goes increased noise levels. This problem was recognized by the engineers of this industry, and in the early '60's steps were taken by the engineers working as individuals through their engineering organizations, and particularly through the Society of Automotive Engineers, starting to do something about the noise problem.

What the construction machinery industry is doing on sound control. Within SAE the Construction Machinery Industry Technical Committee—CIMTC—formed a Sound Level Committee to study the measurement and control of noise in the construction machinery. The manufacturers of construction machines through their association, the Construction Industry Manufacturers Association—CIMA—joined in this effort and established the necessary procedures and policies to recognize needs for performance standards and to promote their development through nationally recognized technical and standards writing bodies such as SAE.

Standards for basic noise measurement that were considered by CIMA and developed or under development by SAE—and this would be under the current Sound Level Committee now a part of the Automotive Council—are:

1. Noise measurement at operator's station.
2. Noise measurement at 50-foot radius.
3. Construction job site noise measurement.
4. Cumulative operator noise exposure measurement along with standardized reporting methods (CONE). I think you got a report on that presented by one of the earlier witnesses.

Now some technical problems and solutions. This committee is continuing its study of noise control with the ultimate goal of recommending lower sound levels commensurate with the advancement of sound control techniques.

The problem has been divided into two areas. The first is that of sound measurement related to the operator at his work station. The second relates to noise control to the surrounding environment of the equipment. So many times I see these two problems being mixed in discussions. They are two separate problems. Because the operator can be encapsulated but the spectator cannot. So these have to be approached from two different bases.

Each of these areas of study breaks down further into short-range and long-range.

The method of measuring sound, of course, is the decibel. It is a logarithmic unit of measure. If two sounds from a tractor, say the engine and the track assembly, each develop a level at 90 dB(A), the sum of the two will be 93 dB(A). We have heard that several times today.

But let's look at it a little differently. If we now want to reduce the sound level by either eliminating the track or the engine completely, we only reduce the overall level of noise by 3 dB(A).

Now consider the designer as he puts together a crawler tractor. You heard quite a bit about that from the preceding witness. He must deal with an engine, transmission, hydraulic system, cooling system, track assemblies, and final drive gearing, all of which are noise producers of varying intensities and frequencies.

To bring levels down he has three alternatives—either muffle, construct barriers, or use sound-deading materials against the sounds generated by the components of the machine or reduce the sound-producing capabilities of the components, or a combination of each.

And I want to reemphasize this point about enclosure. It has been mentioned here, for instance, on air compressors that some very, very remarkable things have been done soundwise. It was done principally with enclosure. Enclosures became larger. This became one of the problems because they had to fight it through the highways and drive it when things were hauled on the road.

In a crawler tractor, as one of the earlier witnesses explained, and in other equipment, the visibility that that operator has to operate under in order to do his job safely and to be safe for those in the surrounding area is of prime importance.

So a major problem in sound deadening by the use of enclosure is very limited in what we can do in this area.

The order of priority for getting at this problem is obvious: Do those things first which require the least change for the most benefit.

We at Allis-Chalmers are experimenting with mufflers, closing of engine compartments, lining of hoods and covers with sound-deadening materials. We are measuring the effectiveness of these short-range procedures as sound control techniques. However, we must also test their durability.

We had an experience working with a company—this was a number of years ago—working in this area of sound. We provided at their insistence certain components, mufflers, liners, sound-deadening materials—at their insistence—because, as we told them, we could not stand behind the state of the art at that stage of the game that these parts would stand up. And, needless to say, those parts did not live.

And to produce machinery on a production basis we have to produce durable machines. The life has to be built into the machines.

Now, we have to test their durability. We have to test their safety from fire hazard. This is sometimes an easily overlooked problem. If a sound-deadening material becomes oil-soaked, it becomes a torch. And a torch is a device in which you provide some sort of a material that will burn. And oil from the various components of the machine will burn.

Some absorbent material used as sound deadening which is one of the best becomes a torch. So fire hazard is a very, very important thing.

Serviceability under the very severe conditions of heat, dust, moisture, vibration, and shock that our machines are subjects to and must endure is important.

We are weighing the tradeoffs in lessened serviceability, effect on reliability, safety, and finally cost.

Our engineers are working on a long-range basis on components such as engines, including combustion chamber design and gear trains in the engines, hydraulic pumps, gearing of transmissions, and piping to determine what can be done to control noise at the source.

To date our successes in both areas have been marginal, and by "marginal" I'm talking about taking them from levels where they have been brought down to to lower levels, not from a high peak of no design activity at all. In other words, we're not satisfied.

The cost implications are high. We have analyzed our machines component by component, estimating the engineering required, the cost impact, and the probable noise reduction to be gained. Our estimates show that to bring the sound level down on the basis of short-range treatment—that is, by the use of mufflers, barriers, and sound-absorbing materials properly installed on our machines—a reduction of from 3 to 6 dB(A) measured at 50 feet from the machine can be gained. The cost increase will be from 1 to 3 percent per machine depending on the size of unit and level of reduction required.

Calculating this back through ownership and operating costs, assuming that our costs are typical, and based on the earlier figures given you obtained from the Department of Commerce publications, short-range noise control will cost the American public about $160 million annually for a 2 to 6 dB(A) reduction.

On the basis of long-range treatment and based on current technology, we find that every major power component in the tractor will require major redesign and retooling. Our estimates indicate that the noise level reductions will again be in the order of 3 to 6 dB(A) additional at 50 feet depending on the size and power of the machine.

Assuming our estimates are reasonably typical, the cost impact long-range is estimated to be 10 percent to 25 percent per vehicle. Projecting this as a direct increase to the work output cost of the machines, since there will be no offsetting production gain, the cost to the American public long-range will be in the order of magnitude of an additional $202 million annually. On top of the short-range program costs, this is a total of $362 million annually for from 5 to 12 dB(A) reduction.

Timing. The development work and retooling time for our company to effect noise control of the order of 2 to 6 decibels short-range is estimated to be 2 years. For a longer-range program to accomplish 2 to 6 decibels across our line of products will take 5 years, and maybe more, from the decision point before the first machine could be produced.

I feel reasonably certain that our situation as to timing just mentioned is typical within 1 to 2 years either way. If this is true it must be kept in mind that the quantity of such machines that would be produced annually will be relatively small compared to the total in use. Therefore, to have any appreciable impact on overall sound reduction through replacement of current machines, due to their relatively long useful life, an order of 20 years will be required, because, as you notice, some of these machines are still running that are 20 years old.

Machinery now in use. As I mentioned earlier, there are some 500,000 to 600,000 machines of the heavy duty construction equipment type, plus thousands of the industrial equipment type currently working in the United States. The only possible way of reducting sound on these units is through muffling, use of barriers, and use of sound-absorbing materials.

As I mentioned earlier, the tests we have conducted on this approach have not yielded satisfactory results in sound control. We are still working on it.

The cost to the user of our equipment in the field could run from $200 to $2,000 per unit for the parts and materials, and, in addition to that, he will have the cost of installation.

The durability and reliability of materials currently being tested has been disappointingly short, which would mean replacement and continuing cost and down time for the user. In addition, the owner would be faced with reduced maintainability and increased fire hazards further increasing his costs.

A suggestion for an approach to noise control. The products of the manufacturer supplying the needs of the construction industry are tools. A wide variety of tools are built and used as parts of a system to be put to work by a contractor on a job that exists to make things better. His presence while always temporary is sometimes considered a nuisance by his neighbors; hence, the press for noise pollution control.

If, instead of trying to improve this situation a piece at a time, it was looked at in its entirety as a system, the possibility of alternate and possibly less costly solutions becomes a probability.

It is visualized for community noise control that total construction site limits be geared to the needs of the surrounding community. This would create a natural demand for quieter machines, yet still allow contractors and users to utilize their well demonstrated versatility and ingenuity to get the job done within reasonable specified limits even with existing machines by new job layout and operational techniques.

An example might be the erection of sound-absorbing barriers between job sites and points which consider noise a nuisance.

Now, in conclusion, there were some questions that were asked—

Dr. Meyer: We don't need that.

Mr. Codlin: We don't need that?

Dr. Meyer: Those were just from the staff to help you set the stage. They are not part of the questionnaire.

Mr. Codlin: Okay. If I could read my own conclusions here, then, I would like to quote from a paper by Mr. H. T. Larmore, Deputy Director for Technical and Safety Services of CIMA, which he gave before a group of industrial hygienists in Toronto recently. I quote:

"It is obvious that construction machine designers and industrial hygienists in both government and private sectors are operating at the threshold of the art relative to noise."

It is apparent that the U.S. Department of Commerce through its National Industrial Pollution Control Committee has recognized this by the holding of these hearings.

We hope that the information presented here, combined with that from the testimony of others, will be used to effectively reach proper noise abatement objectives, and to do so with full consideration of the total needs of our society and at costs and compromises satisfactory to the public.

Thank you, gentlemen.

Dr. **Meyer**: Thank you for a very forthright presentation of how you see some of the problems. Let me, before asking my colleagues if they have any questions, get your reaction to the existing proposal in the Congress, which the Environmental Protection Agency would administer in consultation with other agencies of the Federal Government.

We are proposing that the Federal Government set standards for emission of noise from equipment, not just from the exhaust necessarily, but from the entire system, and are reserving to the States and their political subdivisions the right to set what amounts to use standards or limitations on the numbers of pieces of equipment that can be in a locale. I gather from what you have said here that you favor that approach, particularly where you say you visualize that the total construction limits should be geared to the needs of the surrounding community.

Mr. **Codlin**: This is correct. Because I think one of the earlier witnesses pointed out construction machinery is used in all kinds of different environments. Certainly a machine that is working up on the north slope of Alaska where there isn't anybody except the people who are doing the job themselves working completely covered up with all kinds of clothing to keep them warm has got a different kind of a noise situation than one working in the heart of Atlanta here.

So to have a rule that says all machinery should be at 85 decibels is not realistic. I think it has to be attacked from the community level. What is the specific situation? And I think you can legislate in that area.

Dr. **Meyer**: Well, let me pursue another question that comes to mind. Looking at your statement, you seem relatively pessimistic about the possibility of doing much with existing equipment. Is it your view that this is simply because of the nature of the beast, so to speak. Is it the lack of the market or is it the technical problem?

Mr. **Codlin**: I think it's principally technical, and cost. These two things are always at the opposite end of the balance that the engineer is working on. But if we say, "Well, it's going to be worth it," if that is the considered decision of our society, then we're going to pay the cost, then it comes down to technical, doesn't it?

Dr. **Meyer**: Yes, sir.

Mr. **Codlin**: Some of this machinery is upwards of 20 years old. There have been many different versions of that same basic machine produced and sold. To then impose upon it the situation such as Mr. Hasten mentioned of putting a wide radiator in a narrow space becomes virtually impossible because you cant' move the frame of the tractor out because there's the tracks, and you can't move the tracks out because there's the bulldozer. It's a vicious circle. I think John Prosek mentioned that.

It's just a law of nature that says that a certain size machine has got to be cooled a certain degree, and if you change that cooling rate you have to change the size of the machine. That's just one of the problems. The size of the muffler would have to be introduced. If it's introduced under the hood out of visibility, the space may not be there again. So if you raise the hood the man can't see over it to see when he is bulldozing up to a 200-foot drop. He wants to know where he is. And raising that hood 6 inches can change his vision point by 70 feet, the angle of line.

Does that answer your question?

Dr. **Meyer**: Yes, sir.

Mr. Baron.

Mr. **Baron**: What equipment is included in this CIMA group? Is that cranes and pile drivers too?

Mr. **Codlin**: Yes.

Mr. **Baron**: In other words, non-pneumatic equipment?

Mr. **Codlin**: Yes, CIMA covers—

Mr. **Baron**: The non-pneumatic tools?

Mr. **Codlin**: How's that.

Mr. **Baron**: Non-pneumatic?

Mr. **Codlin**: No, I would say that people who are building pneumatic— Do you folks belong to CIMA?

Mr. **Diehl**: Yes.

Mr. **Codlin**: It's all construction equipment manufacturers who wish to join.

Mr. **Baron**: That includes compressors and cranes and bulldozers and so on?

Mr. **Codlin**: Yes.

Mr. **Baron**: The cost that you talk about of noise control, the annual cost, is based on what point? That there will be X new equipment built every year? We're talking about $160 million for a 2 to 6 dB(A) reduction on page 6. What is that based on?

Mr. **Codlin**: Let me be sure we're tuned in on the same wavelength.

Mr. **Baron**: You say short-range noise control will cost the American public about $160 million annually for a 2 to 6 dB(A) reduction.

Mr. **Codlin**: Okay. That's based on the statement that Mr. MacAllister developed in the Labor Department in those hearings. The Commerce Department sets apart construction equipment in their census reports. At this moment I can't give you by memory the exact breakdown of all the types of machinery that are in there, but I know that this includes all loaders, bulldozers, scrapers, graders, wheel-type vehicles, crawler-type vehicles, crawler loaders. And how far it goes into the cranes I'm not sure at this time. Is there anybody here who can help me with this?

I can't give you an answer on it because I don't have the figures in front of me.

Mr. **Baron**: In other words, those will be installed on old machines and new machines, and so on? I mean that's the thing I'm trying to clarify.

Mr. **Codlin**: Yes. The first was short-range. If you took all the 562,000 machines that are out there and did something with them, you would have this kind of a cost.

Mr. **Baron**: Right. I'm trying to figure how it gets to be annual cost. That's what puzzles me. If you're retrofitting using the equipment already in existence, how do they figure it out?

Mr. **Codlin**: Here's the way I arrive at that. I knew that in developing this paper one of the biggest questions would be cost. And as I told the fellows, I've got my neck stuck out 50 miles on here in trying to give you a feel for cost. And I don't think I'm too far off on it really.

I said there that the cost per unit would be from 1 to 3 percent. Right? This means that the buying price by the contractor would be raised in order of magnitude somewhere within that area.

Now, in order to apply his machine on a profitable basis he has to have a return on investment. So, therefore, the cost of the yard of dirt moved reflects both owning and operating costs.

Now, it so happens that when you add these materials on there at a 1 to 3 percent increase in pure cost, it is almost the same cost on operating, because if the mufflers give out, if the barriers break down, he has to replace all these things. It takes time, labor and dollars and material. So, therefore, owning and operating cost both will change about to the same degree when you add something to the machine.

So taking that owning and operating cost and raising your $9.50 per hour times the number of hours per year times the number of machines will simply give you a cost of about $160 million.

Mr. BARON: Well, I don't know if you are familiar with the report of the Commerce Technical Advisory Board Noise Abatement Panel. They had an economic section. And they said that the cost, if I remember right because I don't have it with me, of reducing many of the noise sources would not be significant. You know, there is a sort of a conflict here which I would like to just bring to the attention of the panel.

Mr. CODLIN: If you add cost to machinery and if a contractor has to buy a muffler, we'll say, and he has to buy a pair of side plates and has to buy a liner for the engine compartment, we'll say, without all the possible problems before, he's going to be paying something for this. Isn't this right?

Mr. BARON: Right.

Mr. CODLIN: If he's going to continue to be profitable he has to recover—right?—or else go out of business. Because 2 percent or 3 percent will take him down the drain if he continues to do it. He just cannot absorb it.

Mr. BARON: This is an assumption that it's going to cost him that every year to maintain the quiet aspects of the equipment?

Mr. CODLIN: That's right.

Mr. BARON: Well, I would just like to—

Mr. CODLIN: So I think probably the other was an assumption too. Certain assumptions had to be made because these are very difficult figures to come by. As I said, I have tried to indicate an order of magnitude. Maybe it's $80 million or maybe it's $240 million. But this is the order of magnitude of the kind of thing.

And believe me if the cost of the yard of dirt increases, the cost of the contract for the road increases, the cost to the taxpayer increases, and that's you and I.

Mr. BARON: Right. And you also mention the law of nature in reference to the physics of noise control. And it is also a law of nature that people require sleep and rest, and so on.

Mr. CODLIN: Yes.

Mr. BARON: And these aspects of the quality environment. And again I repeat what I have repeated several times, which is that we must now consider not only the dollar costs of quiet but the dollar costs or the external cost of this economy as they call it of the degradation of the environment by noise so that the normal processes of living and working and leisure time activities are destroyed. So that too must be put into the hopper.

And it's interesting that we are just gradually— I hope we are starting somewhere on evaluating what these other costs are to match them with these other figures.

Mr. **Codlin**: I don't quarrel with you a bit, Dr. Baron. As you note here, I didn't say let's don't do it. I'm just trying to make everybody aware by making some calculations here what is the order of magnitude. Then we can balance this again. If we can quantify the other, let us balance it. And if our good and wonderful country becomes better for it, that's fine. Let's do it.

Mr. **Baron**: Of course, part of the difficulty is that some of the thing we call quality environment is very difficult to quantify. And when you come up against a figure of $160 million, it looks so, you know, solid and tangible against the difficulties of quantifying this quality of life.

Mr. **Codlin**: I think probably I had an easier time of coming up with this number than you will with the one you are talking about. Isn't that right? Don't you agree?

Mr. **Baron**: You had an easier time?

Mr. **Codlin**: Yes.

Mr. **Baron**: I grant you that.

Dr. **Meyer**: Of course, there's another way of looking at this. You can say that doesn't really sound like very much. This comes out less than a dollar per capita, per year if you want to look at this sort of cost borne somehow by the public. It will be passed on to the public one way or another. And so you say, well, you know, this is a different order of magnitude than something that is going to cost $50 or $100 or $300 per capita.

If you want to talk about it being reasonably—not trivial, but certainly in the real world of the gross national product of $900 billion plus—a dollar per capita for this sort of thing certainly comes into a little bit better perspective.

I'm not trying to play the game either way because this numbers game in the environment gets to be a pretty difficult one to come out winning, because it depends upon which side you're trying to put your chips on. And I'm sure either side can make it pretty formidable, no matter who is right.

That is one of the reasons we are trying to get these facts. I think it is probably safer to say you really don't know whether you're talking about $200 million or $100 million, but it's somewhere in this range. We have had to do this on some other things. At least it gives us some points on a curve that we have got to come to grips with. Do you have any other questions, Mr. Baron?

Mr. **Baron**: Nothing that can top what you just said.

Dr. **Meyer**: Dr. Okun.

Dr. **Okun**: One of the major problems seems to be this matter of retrofitting that large amount of equipment that is now in use. I think you pointed out and others pointed out that the needs for noise control vary from place to place, that in some areas—

Mr. **Codlin**: Correct.

Dr. **Okun**: —there is much less need than there might be in others.

Mr. Codlin: That's correct.

Dr. Okun: Would it be feasible in some way to say that all the new equipment, that which is soundproofed, would be used in those areas that are critical and shift all of these others out of the areas that are not critical and avoid having to retrofit some of the equipment that was going to be used in Alaska, North and South Dakota, and maybe this other—

Mr. Codlin: This is an interesting thought. I think it would probably be better addressed to Mr. Palazzi from the contractors, because he could tell you better than I his logistics problem.

Our machinery goes to our dealer, from our dealer to the customer, and one day that customer will use it in Portland, Oregon and the next thing we know the serial number will turn up in a dealer's place of business for some work or something in New York. So it moves. It moves very rapidly. Whether this again would be a cost push that they could tolerate or not I don't know.

Dr. Okun: Equipment shifts around for need. If you need a bigger piece of equipment on a job, you bring that piece of equipment there. And if it gets to be part of the concept of construction that noise is important, when you have need on a project for noise control, then you use your equipment that has that capacity on the job. And when you don't have the need, you use the other equipment.

Mr. Codlin: I think I spoke to it by suggesting that the ingenuity and the versatility of our contractors—and they are a tremendous group I'll tell you—in their job layouts and their job techniques could be brought to bear.

This again gets back to the business of the community, the local area. That is the problem that you need to hit I think to get this on the road.

Dr. Okun: Could you make a rough order of magnitude estimate as to what percentage of the total use of your equipment is operated in critical areas as contrasted with less critical areas?

Mr. Codlin: Oh, I'm afraid I couldn't. That would take some research to come up with. And I think I would not be qualified to state that. I wish I could help you on it. Maybe if you want me to do some looking I could do something like that. But it would be quite a job to nail down because the stuff is so fluid.

Dr. Okun: Thank you.

Dr. Meyer: Fine. We have heard a lot from the industry groups, and, as I said, we shifted this thing around just a little bit, some of it being because of some unexpected changes in people's travel requirements and some of it being really from a logic viewpoint, which wasn't apparent when we were putting this together. It's rather late, but if Mr. Hansell from the State Department of Health is still here I would like him to give us an overview of how they look at this total problem. I have to again apologize to him as I have to several others. It seems there was greater interest in some of the questioning than we anticipated, sir, and I offer my regrets at making you stay this long, but I did want to get your views toward the end, after you have heard what everybody has said they can and can't do.

STATEMENT OF WILLIAM HANSELL, DIRECTOR OF ENVIRONMENTAL HEALTH, GEORGIA PUBLIC HEALTH DEPARTMENT

Mr. **Hansell**: Dr. Meyer, gentlemen, I appreciate the opportunity to be here. I don't really appreciate being so "dadgum" cold. I didn't know Atlanta got so cold in July. I'm about to freeze to death. (Laughter)

We have a development newly created in the hydro-electric power field, and some of it is right out here. This water came through an electric conduit, through an electric shower outside.

I'm Bill Hansell, Director of Environmental Health of the Georgia Department of Public Health, the biggest State east of the Mississippi River, with the biggest effort in environmental health east of the Mississippi River, in the Southeast at any rate.

Of course, let me say I don't know whether New York is east of the Mississippi River or not. We don't count them folks up there. (Laughter)

I have lived most of my life in metropolitan Atlanta. I was born here, and I have seen the construction game change considerably. As a youngster I was very thrilled to watch construction. I can remember that there was a great deal of teamwork, not just mules and drag pans but human beings that were working as team workers. And there would be a boss who would sing a chant as the work was being done, something to the effect, as you may recall, "This old hammer—h-m-m-m—hit John Henry—h-m-m-m." Every time that team leader would grunt, something would happen. Either they'd lift a piece of pipe that weighed two or three tons—there would be a dozen men on each side of it and move it a foot—or several people would come down with sledge hammers on chisels to break concrete.

They don't do things that way any more. Construction can get to where it's not a pleasure to listen to. And we have heard a great deal this afternoon. I have had my ears opened, not my eyes.

I heard about the spectators on this construction deal. I'm not worried about the spectators. I'm worried about the poor character that is stuck in the building who has a job to do that requires some considerable concentration either for thinking, for conceptual thinking, or for concentration on the machinery that he is working with at hand or she at a typewriter and the like. These people cannot escape the noise, and they are the ones that I worry about in the construction field.

The staccato noise of the air hammer that is breaking the concrete, or the pile driver. There's one in the neighborhood of the State Capitol where my office is now. The power company, thank goodness, is building a new plant, but they are making a lot of noise with it. They want us to know they're there.

But there are a lot of things in the construction field that I as a spectator— "Spectator"? Is that a good word? I don't know what else. It's not an "audiator."

Mr. **Baron**: It's all-encompassing—anybody other than the guy working on the site.

Mr. **Hansell**: That means looking. I'm not talking about looking. I'm talking about being worried to death about a lot of racket I can't control.

Mr. **Baron**: Noise receiver.

Dr. **Meyer**: Maybe you're just a captive of a bum environment.

Mr. **Baron**: Very well put.

Mr. **Hansell**: But these are the things we want to begin to control in Georgia. We look forward to a time in the not too distant future when we will get members of the industry and the construction trades together to sit down and talk about what the person in the captive audience, if you please, has to put up with and at what levels he can perform.

I'm sure that at some time this morning—and I wasn't able to be here to hear the papers but I understand they were very well put forth—that there was evidence that sound does in fact at lower than 90 decibels or 85, or whatever you please, cause considerable annoyance.

I was sitting back there just a few minutes ago. Somebody on the other side of that wall had a vacuum cleaner. It sounded like it was trying to suck up some of our Georgia sunshine. (Laughter) But this noise was very distracting. And yet it probably wasn't 90 decibels. I'm not that technical to know what level it would have been, Dr. Okun. Maybe you thought it was a little stronger than that in here. I didn't.

But there are distractions that we must worry about in our environment. And there are a whole raft of appliances in the field of construction, including the air compressors, pneumatic chippers, concrete breakers. We have got a new device here in Atlanta that we are real proud of. It's an automobile crushing machine. But the poor devil who lives within a mile or mile and a half of it is going to suffer from the noise from it I'm sure for a while.

There is a device that crops up everywhere in Georgia because we raise a lot of wood, and that is the chain saw. This is a little device, and the motor on it is no bigger than that pitcher, and you can hear it for 2 or 3 miles. And if it's on a construction site near your house, it can run you ragged, even more than the two kids hollering in the cribs.

And there is, of course, the diesel equipment which has been very adequately discussed.

I know it's a horribly expensive proposition, but I submit to you that the control of environmental problems is horribly expensive, and if we want to live in this environment—and we must—or die in it—it's going to cost money, and you and I are going to pay the price. There is no other way out of it.

I have a tendency toward being philosophical. If I may, I would like to make a few observations.

Our environment is in large part what we make it. And our environment to a frightening degree makes us what we are.

Now, there was a philosopher in the bygone era who made this statement that has held through the centuries: As a man thinketh in his heart, so he is."

There is a definition in the large Webster's dictionary on noise that says, amongst other things, it's an unwanted signal that enters the electronic communications systems or that is created in it and that tends to interfere with the desired signals. I submit to you that the thinking process, and the neurological process, in some ways is an electronic system. Noise interferes with this.

If as a man thinketh in his heart so he is is true, then I submit to you that if the thought process is befuddled and distorted by noise, thus will be the man.

As far as I'm concerned, noise must be controlled, and it will be our intention in this State of Georgia to bend every effort to make the environment livable from the noise standpoint.

Thank you very much.

Dr. MEYER: Thank you, sir, for for an excellent contribution to our proceedings by adding to it not only some factual observations on the spectator and on those who must put up with these situations without any choice, but some well stated philosophy. Are there any questions from the panel?

Professor Lyons?

Dr. LYONS: No.

Dr. MEYER: Mr. Baron?

Mr. BARON: I was just wondering if you had any thoughts to throw out. Have you reached a program development stage yet to achieve this nirvana?

Mr. HANSELL: I have a young man sitting somewhere in this room. I will not point him out. He is a graduate engineer, and he is doing his best to pick up all the knowledge he can on noise. We will begin a program in the field of the industrial hygienists, because this is where a lot of these things start out—like our air pollution control work started there—and eventually we hope to develop this into a full-blown program.

It is going to take us some time, maybe even as much time as it is going to take Dr. Meyer, but I hope not.

Dr. MEYER: Dr. Bender?

Dr. BENDER: No questions.

Dr. MEYER: Mr. McCarthy?

Mr. MCCARTHY: No questions.

Dr. MEYER: Dr. Okun?

Dr. OKUN: Are you thinking in terms of specific regulations to apply to the State as a whole? Or do you expect that it would be variable from place to place, urban settings versus rural, and that sort of thing?

Mr. HANSELL: This is one of the things that will come out of the deliberations of this committee, but I would tend to think that in the area of the community where we anticipate people to be awake, say, in the work area, that we could probably anticipate tolerating a little more noise levels than we could where we would anticipate people being at rest where they live supposedly—although I live downtown and I go home for a few hours every night. (Laughter)

Dr. MEYER: Well, I would echo one of your thoughts here and say it slightly differently. A German philosopher, about 1840 or so, said that the degree to which a civilization accepted noise was sort of the inverse of their intellectual capacity. In other words, the more stupid the society is, the more noise it would tolerate. And I think perhaps that means the time has come for us to get smart. So thank you very much, sir.

Is Mr. Mahoney here still? Mr. Mahoney was going to offer a few words, and I told him that if he chose, which apparently he has, we would have him tomorrow.

Before recessing until tomorrow, let me say the following. I appreciate the fact that such a large group of interested people has participated in today's hearings, and, further, I appreciate the fact that so many of you have stayed with us through what has been a long and, to me fruitful day.

Mr. Ruckelshaus, the Administrator of the Environmental Protection Agency, is most desirous that we get maximum interchange with the various public, professional, and industrial interests, and this has certainly gotten us off to a very good start.

We were going to show a film that the National Bureau of Standards has prepared. But with the intrusion into this environment of some "Georgia sunshine" in a liquid form—which I can now say since the representative of the State has said it—(laughter)—I really think we ought to defer that. I am afraid that we may have to start a little barge operation if we don't. So we will show this film first thing in the moring at 9:00 o'clock. It is a very interesting, good light and sound show, showing some various types of equipment and the noise generated thereby. If you can bear with us and stay with us we would appreciate it.

We have a large group of public witnesses, plus several people who couldn't stay because of the change in schedule, and I am sure they will be making a major contribution to tomorrow's proceedings.

I also would announce that, as is the case with any other public hearing of this nature, we will hold the record open for 30 days from tororrow, so in the event that any person in the audience has something that they feel they would like to have said or should have said or want included in the record, I will be happy to receive it. It will be incorporated. Such communication will be incorporated in the official presentation to the Administrator and to the Congress and become part of the official records.

So again, ladies and gentlemen, thank you very much. I appreciate your help and assistance.

(Whereupon at 5:55 p.m., the hearing was recessed, to be reconvened at 9:00 a.m., Friday, July 9, 1971)

ENVIRONMENTAL PROTECTION AGENCY

Public Hearing on Construction Noise

Friday, July 9, 1971

The hearing was reconvened, pursuant to recess, at 9:15 a.m., Dr. Alvin F. Meyer, Jr., Director, Office of Noise Abatement and Control, Environmental Protection Agency presiding as Chairman.

PANEL:

- Dr. Erich Bender, Bolt, Beranek & Newman
- Dr. D. Lyons, Clemson University
- Mr. R. A. Baron, Citizens for a Quieter City
- Mr. Gerald P. McCarthy, Governor's Council on the Environment, State of Virginia
- Dr. Daniel A. Okun, University of North Carolina

ATTENDEES: (At July 9th session only)

- K. S. Kronoveter, National Ins. for Occupational Safety & Health
- George Allgood, FAA (Atlanta Airport)
- James Rickard, FAA
- Lutz Kohnagel, Engineer
- R. L. Smelley, N.O.I.S.E.
- Mrs. Charles Yarn, S.A.V.E.
- R. H. Taylor, Liberty Mutual
- R. O. Witte, Crum & Forster
- Virginia Smith, Atlanta TB & RD Association
- Frances Fisher, Atlanta TB & RD Association
- Frances Gammill, Atlanta TB & RD Association
- Marvin Cloer, Alliance for Labor Action
- J. M. Benson, Citizen
- Blanche Hood, Citizen
- Harold Joyner, Decatur Civic Association
- Charles Wilson, Georgia Tech
- Priscilla Holman, Citizen
- Thomas Muehlenbeck, City Manager, College Park, Ga.
- Mrs. Robert Rea, League of Women Voters
- Adele Northrup, Morningside-Lenox Park
- Flay Sellers, Georgia TB & RD Association
- Virginia Gaddis, Morningside-Lenox Park
- Virginia Harbin, Georgia Conservancy
- William J. Doughorty, North Georgia American Institute of Architects
- Mrs. James H. Carter, American Association of University Women
- Glen E. Bennett, Atlanta Regional Planning Commission
- Furman Smith, S.A.V.E.
- Mrs. Robert Meller, Private Citizen
- Mrs. Elinor Metzger, Atlanta Fulton Co. League of Women Voters
- Mrs. Donald Lyons
- L. E. Abernathy, Atlanta Association, Senior Citizens Clubs

PROCEEDINGS

Dr. Meyer: Ladies and gentlemen, I am calling to order the second session of the Environmental Protection Agency's public hearing on noise, particularly noise associated with the construction industry.

Some of you were here yesterday, and I welcome you again. And to those who are joining us for the first time today, I extend to you the greetings and the appreciation of the Administrator of the Environmental Protection Agency, Mr. William Ruckelshaus.

Again, by way of getting this underway, I would like, for those of you attending for the first time, to say that these hearings are being held under the authority of Act of Congress, Title IV, Public Law 91-604, which requires that the Administrator of the Environmental Protection Agency, through an Office of Noise Abatement and Control, prepare a report to the Congress on the problems of noise in the United States and what can be done about it. And in preparing such a report, a series of public hearings must be undertaken. This is the first of a series of eight hearings that will be held around the United States to obtain information regarding noise as an environmental problem.

Yesterday, we heard from a series of witnesses from various segments of industry concerned with construction, construction equipment, and construction operations. Today, we are going to hear from a series of individuals who have an interest in noise in general or noise problems, environmental and ecological.

We in EPA are deeply interested in obtaining facts. We want to hear all sides of the issues relating to the environment so that we may do a better job from the Federal Governmental viewpoint in serving the public and the United States.

Before undertaking the presentations, we thought it might be useful for us to show you a film on noise and noise problems that has been developed by the National Bureau of Standards of the Departmentof Commerce, one of our sister agencies in the Federal Government. We will show this film now, and then later on today. In case there are some people who want to see it again, it will be available for showing during the noon recess.

(Film)

Dr. Meyer: Well, we hope that that gave you some impression of the broad spectrum of acoustical energy to which the American public is exposed, either because of choice or because they have no choice, as was shown several times during the film. At this point, then, I should like to proceed with the morning's program and invite Mr. George Grindley of the Hearing and Speech Center of Doctors Memorial Hospital to come forward if he is here. Is Mr. Grindley here?

(No response)

Well, if not, I will hold his spot on the program open for him and ask Mr. Smelley, Southeast Regional Director of the National Organization to Insure a Safe Environment, to come forward if he is present. Mr. Smelley, do you have a prepared statement? If so, would you give it to the clerk?

Mr. Smelley: I don't have anything ready for publication.

Dr. Meyer: All right, sir. Thank you very much.

STATEMENT OF R. L. SMELLEY, SOUTHEAST REGIONAL DIRECTOR, NATIONAL ORGANIZATION TO INSURE A SOUND-CONTROLLED ENVIRONMENT (NOISE)

Mr. Smelley: Dr. Meyer had the name of the organization just about correct. N.O.I.S.E. stands for National Organization to Insure a Sound-Controlled Environment. It is a relatively new organization, having been in existence for less than 2 years. However, it claims membership of more than 33 cities across the United States, representing some 14 States, and serves as a spokesman for several hundred thousand people.

I am R. L. Smelley. I am a member of the Board of Directors of N.O.I.S.E. and am the Southeast Regional Director of N.O.I.S.E.

I am an elected official in College Park, Georgia, serving as Mayor Pro-Tem of that city.

I would like to briefly comment on College Park and its noise problem. College Park is immediately adjacent to Atlanta's Hartsfield International Airport, the fourth busiest airport in the Nation. I have been a resident of College Park for over 18 years, predating the introduction of jets in commercial service at Atlanta's airport by more than 7 years, as have most of the citizens of College Park.

The Atlanta Region Metropolitan Planning Commission's comprehensive plan for airports dated September 1966, which is currently being implemented by construction activities at the Atlanta airport, identified noise as a severe problem, and they recognized their responsibility for making, and I quote, "comprehensive surveys and studies of transportation facilities, land use, public utilities, governmental facilities and services, natural resources, and other physical, social, and economic factors, conditions, and trends that are relevant to the probable future development of the district, and to make and, from time to time as it may deem proper, amend, extend, or add to the master plan for the orderly growth and development of the district as a whole."

Yet their recommendations did not include any means of mitigating the noise problem. Indeed, their recommendations which are presently being implemented at the airport are further compounding the problem on the basis of air traffic alone without regard for the derogation of the living environment of the many thousands of people in the adjacent communities.

Further, their runway utilization according to FAA information is based on convenience for taxi time and ground access without regard for the impact on the airport's neighbors.

The reason for directing these opening comments toward the situation that exists at College Park and the Atlanta airport is because through the N.O.I.S.E. meetings I have been made aware that the situation that exists here is not unique. It is being duplicated many times at most major airports.

The inescapable conclusion is that FAA has defaulted in its responsibility for the protection and welfare of the people on the ground as well as the people in the air.

The Federal Aviation Act of 1958, section 307(c), charged FAA with the responsibility for "the protection of persons and property on the ground." Despite this Congressional direction which was incorporated in the Act establishing the Federal body, the FAA has yet to recognize its responsibility for the welfare of the people on the ground.

Recognizing the FAA's massive deficiency, the Congress in 1969 enacted the Environmental Policy Act and in 1970 authorized the establishment of the Environmental Protection Agency.

Why, gentlemen, was the EPA established? I would like to suggest one major reason is to require the implementation of measures which will tangibly reduce the exposure of hundreds of thousands of people, of our citizens, to excessive levels of aircraft noise.

The question you may be asking yourselves at this moment is what measures you may adopt which will be effective in reducing the problem as soon as possible and which will fully resolve the problem in the future.

In response to this question, let me refer you to Dr. Meyer's remarks when he spoke to the assembled delegates of N.O.I.S.E. in Washington on May 19th of this year, and I quote again:

"Noise differs from most other environmental pollutants in one very important aspect. The knowledge and technology exists now to control almost every indoor or outdoor noise problem."

In these, the 1970's, where voters considering themselves to be environmentalists certainly constitute a majority at the polls, the highest levels of our governments are responding to citizens' needs through both Congressional and Presidential actions.

The President has formed his Council on Environmental Quality, and the Congress has now enacted specific legislation to improve environmental quality by the establishment of the EPA. It has also through enactment of the Airport and Airway Development Act of 1970 directed that environmental quality not be degraded through Federal expenditure for aviation facilities.

We believe that FAA is incapable of correcting its deficiency regarding its responsibility for the acoustic environment of the people on the ground. Therefore, we ask that EPA establish noise exposure standards and impose these standards upon the various Federal agencies charged with the responsibility of promoting and regulating all forms of transportation service.

We agree with Dr. Meyer that the knowledge now exists to control and ultimately eliminate the aircraft noise problem. What is lacking is the resolve to do it.

Acting as a spokesman for many thousands of people who are daily subjected to unbearable levels of noise from aircraft, N.O.I.S.E., the National Organization to Insure a Sound-Controlled Environment, offers the following recommendations:

1. EPA acting together with Department of Housing and Urban Development and Health, Education, and Welfare should immediately set maximum limits on community exposure to aircraft noise. These limits should be based on human acceptability criteria rather than on technical achievability, as was FAA's responsibility in adopting FAR Part 36, Federal Aviation Regulation Part 36.

It is submitted that HUD acting as chairman of the land use-airport study panel of the Interagency Aircraft Noise Abatement Program already has in hand noise exposure standards acceptable for immediate adoption.

2. The Director of EPA should immediately take steps to amend the wording of the Administration's noise Control Act of 1971 as it relates to aircraft noise. The existing wording relegates the EPA to an advisory capacity only, wherein EPA may only request the FAA to review or revise the aircraft noise standard. In this relegated capacity EPA is powerless. Only if the FAA and

other government agencies are required to reduce noise exposure to acceptable standards will significant noise reductions occur.

We submit that the EPA is the proper agency to establish noise exposure standards and has under existing legislation requisite authority to enforce such standards.

In closing, we have the knowledge, we have the goals, we have the authority, and we must rely on EPA to have the will to act. Thank you.

Dr. **Meyer**: Thank you very much.

Panel, any questions?

Dr. **Lyons**: I wonder could you leave us a copy of that? We can copy it.

Mr. **Smelley**: Certainly.

Dr. **Lyons**: It is in the transcript, but it would be quicker if we could have it.

Mr. **Smelley**: I would be happy to.

Dr. **Lyon**: The clerk here can get a Xerox of your notes.

Mr. **Baron**: When you refer to HUD having standards for human acceptability near airports, will you let us know what document?

Mr. **Smelley**: The document has not been published, Mr. Baron, but I am advised by reliable sources that in the capacity where they were acting as chairman of this study committee the various standards were developed and are a matter of record, and I feel they certainly could be obtained and could be immediately implemented.

As a matter of fact, N.O.I.S.E. would like to suggest that a study committee or a meeting be held in Washington wherein these agencies are called together, HUD, HEW, EPA, and we would also like to be represented.

Dr. **Okun**: Do you feel that the local agencies, local communities, or even State agencies are powerless in this matter?

Mr. **Smelley**: In the relegated authority which they have presently, the only agency which really has the authority to act now is FAA, and they have demonstrated their apparent unwillingness, inability, or lack of desire to act.

Dr. **Bender**: You mentioned that you would like to see limits set on exposure to aircraft noise based on human acceptability rather than technology feasibility.

Mr. **Smelley**: Yes, sir.

Dr. **Bender**: Have you come up with any numbers that you think are acceptable for sound levels?

Mr. **Smelley**: I think these numbers can be presented, and we would like again, if such a meeting could be conducted in Washington, to present those collectively at that time.

Dr. **Bender**: You say they can be presented. Does that mean you have them?

Mr. **Smelley**: Yes, one of the representatives of our organization has them. Were you not at the meeting in Washington, Mr. Bender?

Dr. **Bender**: Probably not.

Mr. **Smelley**: Well, we have a couple of people who have some 35 years' experience working in noise and acoustics, and such standards have been developed that could be presented.

Dr. **Meyer**: Any other question?

(No response)

I would like to make several comments. First, Mr. Smelley, I appreciate very much the candid statement of your views and the views of the organization that you represent. Secondly, I would like to suggest that you arrange for an in-depth presentation of your views on transportation noise, particularly highway and aircraft noise, for our public hearings to be held in Chicago.

We have extended to your organization an invitation to appear both at Chicago and San Francisco, where we will be discussing standards, regulations rulemaking and some of the State and local problems. So I would like to urge that we get this out into public view at that meeting rather than here.

Mr. **Smelley**: Yes, sir.

Dr. **Meyer**: With regard to EPA's present role, I feel I must remind everyone that the only real authority that this agency has with regard to noise is as follows: To undertake study on the noise problem, which we are doing in depth by exploring all of the things that you have just mentioned—who is responsible for what in the government, what their authorities are, how they are exercising them, if at all, as well as all the various technical and scientific information available—so that we can perhaps obviate the need for a multiplicity of reports for the future. This ought to be the report to end all reports, at least for the time being—not that we want to shut off the flow of information. And part of that, of course, is developing the kind of information you have presented pointing out some of the problems.

The only other authorities that we have are those relating to the part of the Act that has assigned to the Administrator of EPA authority to require that he be consulted by other agencies when they are undertaking actions that are going to result in noise that he deems to be a nuisance or otherwise objectionable. Now, this of course, does not extend backward, such as a review FAR 36. It simply says that I now have for the Administrator, EPA, authority to say to FAA, "If you are going to do certain things that are going to create noise, you must consult with us and get our advice."

And related to that is the Public Law 91-190 requirement that we review all environmental impact statements, which includes the issuance of rules and regulations—we have defined that as including changes in flight paths of FAA—and give the FAA our opinions. As you know, these environmental impact statements are available for wide public scrutiny and may even be the basis of citizen suits, as they have been. This is the extent of the responsibility that we now have.

So, while I wish I could do something more specific about some of your recommendations, until Congress passes the legislation that it is now considering, this Agency is primarily an information-gathering and intent-review agency. The legislation that is proposed, however, and I don't want to take too much of your time with this, will give the Agency some rather extensive authorities.

I shall certainly communicate back to the Administrator your recommendations. Of corse, as you also know, when it comes to changing the legislation it is really a function of the Congress rather than the Executive Branch. And we submit proposals, but it is still up to the Congress to make changes such as you have suggested. But I shall communicate the information that you have given us directly to those concerned with this matter. I do appreciate your views, and they shall be included, noted, and acted to the fullest extent possible.

Mr. **Smelley**: May I respond to your comments briefly?

Dr. **Meyer**: Yes, sir.

Mr. **Smelley**: No. 1, regarding the legislation, of course, this is one of our primary recommendations, and we recognize that it does require enactment by Congress. But we can assure you that N.O.I.S.E. and again the hundreds of thousands of people that we represent will be pushing for this.

Dr. **Meyer**: Very good.

Mr. **Smelley**: Through their elected representatives.

No. 2, as we attempted to express to you upstairs briefly earlier, Dr. Meyer, we recognize that you are authorized only to make studies. However, our concern is that the technology, the knowledge is available. Some things can be studied to death. We think that action can be taken immediately which will provide tremendous improvement of the problem.

And, No. 3, regarding the matter of aircraft flight paths, and specifically relating it to FAA's role, we know that procedural improvements have been developed by various airlines and which have been implemented. I have copies of the flight bulletin in my briefcase that has been developed by Captain Paul (Soderland) of Northwest Airlines, which has reduced just through procedural changes the level of noise by in excess of—well, 16 dB(A).

Now, 10 dB(A), as you are well aware, is reduction by 50 percent of the noise level.

Now, we cannot understand where such knowledge and techniques are available why an agency who has the responsibility does not enforce this on other aircraft carriers.

Dr. **Meyer**: Well, as I said, I am most pleased to get this information, and I assure you that we intend to act in a positive manner. I indicated in my remarks that we are not going to study this problem to death. And I am most hopeful that we will have some of the technical details at the session on aircraft noise in Chicago, because I think this will get very high visibility. And we will certainly take your recommendations and discuss this with the appropriate parties.

Mr. **Smelley**: Thank you very much.

I have one further request. There has been a demonstration by Northwest Airlines where they have demonstrated the techniques developed. Three separate agencies have measured the improvements in noise standards. And each of them recorded effectively a 16 dB(A) reduction.

The demonstration had limited exposure to the public. We would request that EPA arrange for a similar demonstration to be conducted again at Dulles airport if possible such that a number of our elected representatives with whom we have already talked and who have expressed a definite interest in observing these demonstrations could attend and observe.

Northwest Airlines has indicated their willingness to participate in the demonstration again, and we feel that Delta Airlines, the Atlanta-based airlines, would also be willing to participate in this.

Dr. **Meyer**: Very good. In order to help us expedite making such arrangements, would you leave with the clerk the name of your contact in both of those airlines.

Mr. **Smelley**: Yes, sir.

Dr. **Meyer**: We will take that under immediate advisement.

Dr. **Bender**: Sixteen dB(A) is a phenomenal reduction. How did they achieve that?

Mr. **Smelley**: Strictly through procedural improvements.

Dr. **Bender**: What sort of procedural improvements?

Mr. **Smelley**: I can leave a copy of the pilots' bulletin with you if you would like a copy of it. That defines exactly the procedures to be followed.

Dr. **Meyer**: Very good. Thank you very much. We appreciate, as I said before, your candor, and I can assure you the Agency will act as it is supposed to, which is with concern for the protection of the environment.

Mr. **Smelley**: Thank you, sir.

Dr. **Meyer**: Thank you very much.

Has Mr. Grindley arrived?

(No response)

In that case, is, Mrs. Jones, the representative of the Sierra Club present? Would you kindly come forward, and join us at the platform?

STATEMENT OF MRS. WIRT JONES, SIERRA CLUB

Mrs. **Jones**: I am still a bit shattered from your early morning presentation of some of the "pleasant" sounds that we experience every day. I hope it won't interfere with my ability to present this.

The primary purpose of the Sierra Club, since it was founded in 1892, has been the preservation of wilderness.

Wallace Stegner said:

"Something will have gone out of us as a people if we ever let the remaining wilderness be destroyed; if we permit the last virgin forests to be turned into comic books and plastic cigarette cases; if we drive the few remaining members of the wild species into zoos or to extinction; if we pollute the last clean air, dirty the last clean streams and push our paved roads through the last of the silence, so that never again will Americans be free in their own country from noise, the exhausts, or the stinks of human and automotive waste.

"And so that never again can we have the chance to see ourselves as single, separate, vertical and individual in the world, part of the environment of trees and roads and soil, brother to the animals, part of the natural world and competent enough to belong in it."

Today highway, construction noise, aircraft noise, and various other unnatural noises threaten the solitude of that pitifully small bit of wilderness which we have been able to wrest from the grasp of the exploiters who would dam up, cut down, pave over, or subdivide everything they can get their hands on. The peace and solitude of wilderness is more and more frequently shattered by the blood-chilling whine of a saw as the timber companies feverishly reap hundreds of thousands of acres even in our protected national forests. Even ancient redwoods, some of which were only seedlings when Christ was born, are being desecrated; their magnificent trunks come crashing to the ground so the people can have picnic tables and fancy shingles.

One of the greatest recent threats to the tranquility of wilderness was the SST, which for the moment is dead, but not buried, and which may even yet be resurrected and sent into the heavens.

Our most remote wilderness is now regularly subjected to sonic booms and aircraft noise.

The highway departments create great pandemonium during construction of more and more unjustified wilderness roads. This pandemonium is rapidly replaced by a different kind of clamor as the automobiles devour ever more elusive tranquility.

Because of the complexity of today's problems, the Sierra Club has recently broadened its purposes to include protection of man's total environment. In the cities, our homes, which were once considered our castles, are constantly inundated with noise as builders bring in their great, deafening machines to tear down our communities, rearrange the earth, and build fancy buildings for great profits. Aircraft noises help deafen us.

We are forced to submit to the noises of destruction as our neighborhoods are torn down to build more superhighways through our cities, construction noises while they are built, and then constant deafening, annoying levels of noise once built.

Why must we have these noisy corridors which disrupt our neighborhoods and our lives forced upon us? Why is our government mute to the distressed cries of its citizens who are trying to preserve some tranquility and peace in their lives?

I would like to add that in Atlanta today we are experiencing many problems with highways. There are citizens who do not wish to have their neighborhoods destroyed by the noise and the vibration of the highways. They are not being listened to, in spite of the Environmental Policy Act. Citizens are having to take their cases to court. They are being ignored. The highway department is totally ignoring the citizens.

And noise is probably one of the biggest considerations in these highways. And certainly the wishes and the feelings of the citizens for peace and quiet should be a consideration.

I hope that when regulations are decided upon or you decide the policy which the EPA will follow that they will include this consideration especially of highways within the city as well as highways through wilderness which are a great problem and really not recognized as such by the highway department and by our government in general.

Thank you.

Dr. **Meyer**: Thank you very much.

Questions or comments?

(No response)

I have a couple of questions that I would like to direct to you if I might, because I share your views, particularly about the wilderness problem and the preservation of open spaces and tranquility.

One of the things that we have gotten very concerned about, in addition to what you have documented, is the problem of noise associated with the use of National and State Parks. I am talking primarily about the use of motor bikes, snowmobiles, camping equipment with motor generator sets, and equipment of this sort.

How does the Sierra Club feel or how do you feel personally, if you don't think you can speak for the local clubs, about restricting the numbers of people that can use the National Parks and some sort of a use restriction? This would be in addition to any standards we would publish. Part of the problem is the aggregation of large numbers of these types of vehicles, which may necessitate the banning of motor bikes from the National Parks. We have been talking with the Park Service about this.

Mrs. Jones: I am not familiar with the National Sierra Club policy concerning motor bikes and this type of thing. But speaking from a general knowledge of the policy of the Sierra Club, I would say that, as I said, preservation of wilderness and animal enjoyment of wilderness but not overuse of wilderness and not destruction. And these things destroy the real purpose of wilderness.

So to me it follows that these things should be things, like motor bikes, in my personal opinion, that do not belong in National Parks. They tear up the trails and create permanent destruction. And from what I have been able to read about the damage that noise does to wild life, and so on, it is going to interfere with the ecology and with the animal life, and so on, as well as being destructive to the people who wish to use the parks.

And really when I say preservation of wilderness, we hope to preserve the wilderness but not to see it overused, to keep it in as natural a state as possible.

And such things as in National Parks such as swamps and areas like this, some people feel that motorboats and the loud noises brought in by man as he goes in to enjoy this are all right. My personal feeling is that these should be left out as much as possible and that the noise level should definitely be held down.

Mr. McCarthy: Mrs. Jones, we are familiar with this problem. Up in Virginia it has become a problem in the offshore islands where you have just the slightest disturbance by man causing certain species of wild life to essentially abandon the area.

What I'm getting at is that yesterday we discussed in proposing standards: Should we have varying levels of standards for varying situations? Can you give us your opinion on this?

Mrs. Jones: I think you very definitely should. For instance, the highway department proposes highways through wilderness areas which are annoying and they will keep animals away from the area of the highway, and then they build "tunnels" or passages under the highways for the animals when they build them through wilderness areas or wild areas or park areas. And it is documented that the animals will not use these tunnels.

The animals are going to move back away from any area where there is a lot of noise. And as you said, some species of animals will completely leave the area. And it interferes with the travel, the ecology, because the animals cannot pass back and forth to thier watering areas, and so on.

So I feel that very definitely this should be a separate type of standard for areas where we choose to keep some wilderness or parks or to preserve the ecology.

Mr. McCarthy: Another lengthy discussion we had yesterday concerned whether the standards ought to be applied to the contractors, to the operators, or to the equipment manufacturers, or to the engine manufacturers, for that matter, for construction equipment. Do you have any view on that?

Mrs. JONES: I think they should be applied all the way down the line, because as I was talking to the man from Ingersoll-Rand yesterday, they put mufflers on their construction machines and the men who drive the machines took them off in spite of the fact some of them were even welded on.

And I think that you have to make it a regulation for everyone and then no one can pass the buck saying that, you know, he didn't know or that he wasn't responsible or that somebody else should have done it and it should be enforced all the way down the line.

Mr. McCARTHY: Thank you.

Dr. MEYER: Thank you very much. One comment that I would make is that when the time comes for this Agency to set regulations and standards I can assure you and everyone here that we are going to again discuss the proposals with the public, so that we may get all views taken into account in arriving at our regulations.

Thank you very much.

I understand Mr. Grindley of S.A.V.E. is now with us. Glad to have you with us, sir, and we look forward to hearing from you.

STATEMENT OF GEORGE H. GRINDLEY, AUDIOLOGIST, ADMINISTRATOR OF DOCTORS MEMORIAL HOSPITAL HEARING AND SPEECH CENTER, ATLANTA, GEORGIA, ON BEHALF OF SAVE AMERICA'S VITAL ENVIRONMENT (S.A.V.E.)

Mr. GRINDLEY: Thank you.

I am happy to be here to present this paper for S.A.V.E.—that is, Save America's Vital Environment. This is a nonprofit organization, located here in Atlanta.

My remarks will cover several areas, beginning first with estimates of the amount of damage to hearing of people who work in high noise levels.

Reliable estimates indicate that 15 million persons have some hearing impairment and that hearing aids are indicated to provide serviceable hearing in 1.5 percent of the male population between 30 and 39 years of age. This rises to 4 percent in the 50 to 59-year-old age group. If we use an industrial population where men are exposed to higher noise levels than in the general community, 26 percent of the 50 to 59-year-old group require hearing aids or auditory assistance of some sort.

The Guide of Conservation of Hearing and Noise, prepared by the Academy of Ophthalmology and Otolaryngology, presents a table of damage risk criteria in which they state that if a person begins his work at age 20 and works until he retires at age 65 that he takes a risk of developing a hearing handicap if he works in 85 dB of noise or greater during his work life. The percentages range from 6.5 percent if he works in 85 dB on up to 55 percent if he works in 115 dB of noise.

Again, this table assumes he will be exposed during his work life and retire at age 65.

What this says is that one out of every two people exposed to 115 dB continuously during his work life will have a hearing handicap. A hearing handicap is usually defined as an average hearing level of 26 dB ISO in the speech frequencies. However, in my experience many handicaps are possessed by people who don't meet this criterion. That is, they are unable to collect for compensation for hearing even though they have extreme difficulty in their normal communications.

It is this last group that I am primarily concerned about because compensation boards do not consider them to have a serious handicap. However, experience proves that they do have serious handicaps. Many people come to my clinic complaining of being able to hear but not able to understand what is being said and they show many signs of psychological impairments because of withdrawal from social situations where communication is required.

At present, the Occupational Health and Safety Act requires that employers who allow 90 dB(A) to exist in their plants must protect the hearing of their employees. However, the medical profession is aware that 85 dB can produce a hearing handicap. We must remember that quoting this figure of 85 dB as causing a hearing handicap indicates a prolonged exposure during the greatest portion of a person's working life.

In recent testing of employees who work in a cotton mill, I found 23 percent of 300 people tested failed the established criteria of 26 dB ISO in the speech frequencies in one ear or both. It is my estimate that approximately 15 percent of the 300 have loss primarily due to noise exposure during their work life. These losses were considered to be permanent threshold shifts.

It is known that up to 35 dB of temporary shift can occur during a work day which leaves workers partially handicapped in the evening hours until their hearing can return to their normal.

Some of the facts that we know about temporary threshold shift follow:

1. The temporary elevation of auditory threshold which results from one day's exposure to noise levels of 100 dB or more may vary from no shift to 40 dB and we know that no two people respond the same way to noise exposure.

2. Exposure to typical industrial noise produces the largest temporary loss at 4000 and 6000 Hz.

3. The major portion of the temporary loss occurs during the first 1 and 2 hours of exposure.

4. The amount of temporary loss is roughly the same for the same person from day to day but varies from person to person according to a normal statistical distribution. That is, few persons have very large or very small shifts and most of the losses cluster around an average value midway between the large and small shifts.

5. The amount of temporary loss and its frequency location vary with the amount and frequency location of the permanent loss. The more the permanent loss at any frequency, the less the temporary loss at that frequency.

6. Recovery from temporary or transient hearing loss occurs mostly within the first hour or two after the noise exposure has ended.

These statements are taken from Dr. Aram Glorig, who served as the Director of the Subcommittee, Noise Research Center, Los Angeles, California.

Moving now from some of the medical aspects of hearing loss, I would like to describe some of the machines that are used in construction-related work and their accompanying decibel measurements.

In much heavy construction work, machines with large power plants produce a high level of noise. To mention a few, Caterpillars of varying sizes are known to produce in excess of 100 dB of noise. Air drills measured here in Atlanta on a construction site on a public street measured 110 dB. Some are known to measure up to 120 dB.

Distance from the noise source to the ear has a lot to do with the amount of dB exposure. That is, a person who is very close to the air drill may experience 120 dB, whereas a person down the street may experience 90 dB. A heavy diesel shovel used in quarrying can produce in excess of 90 dB, as do pit trucks, also used in quarrying. Hoist cranes and rock screens, integral parts of the quarrying operation, emit from 90 to 110 dB. Bulldozers that are all sizes generally produce in excess of 100 dB of noise. Front-end loaders, which are very common in construction work, produce 95 dB. A cement truck pouring concrete will produce 100 dB.

All of the above readings are made on the "A" scale, which is relatively close to the response of the human ear.

Work in textile mills can produce levels from 85 dB on up to 110 dB. Exposure in construction work can be for a continuous 8 hours, but in many cases there are intermittent delays during the work day which allow some ear rest. In mills, however, the noise is generally continuous except for a short lunch break.

We must remember that length of exposure has much to do with the amount of loss incurred, not just overall level of noise.

Measurements made inside the cabs of large trucks measure in excess of 90 to 100 dB. In many cases truck drivers will gut their mufflers to give them more power, which in effect also gives them more noise.

These are a few of the noise levels that are well known in construction work and in other types of heavy manufacturing. Knowing the problem, however, is only half the battle. It is desirous that much of the high noise levels of heavy manufacturing equipment be lowered below the damage risk criteria. However, in many cases with our known technology this is impossible. There are many types of industry where it is felt unapproachable.

Personal hearing protection is an avenue that can be useful in preserving hearing. However, many problems accrue as a result of trying to encourage workers to wear protection that they insist they don't need because they have been in the noise for many years and they still hear fine. I have tested employees in the work situation that had a considerable hearing handicap according to compensation scales. However, they checked a box indicating that their hearing was good.

So much of hearing loss one becomes accustomed to if it occurs gradually rather than suddenly. Many employees have told me that the noise doesn't bother them, and it is simply because they don't hear it as loudly as they once did. In other words, they are becoming deaf. Hearing protection is somewhat uncomfortable in the beginning, but one adapts to it readily as time passes. There is also the accompanying feeling of fresh ears that many workers experience at the end of the work day that convinces them that hearing protection is a good thing.

It is my feeling as a result of wearing hearing protection for several weeks and perhaps months and years that employees will feel as attached to their ear protectors as they would to their glasses or perhaps other safety devices that are well accepted in industry.

Preserving the hearing of employees exposed to high noise levels is an extremely easy task if approached in the right spirit. However, it is not as easy to show concretely that hearing has been protected or hearing has been lost as a result of further noise exposure. At present, hearing test measurement is an exact science that requires careful calibration and training and can be accomplished successfully, but this is not practiced widely throughout the country.

Hearing measurement is the only way to assess if your hearing conservation program is adequately accomplishing the task of preservation of hearing. Hearing protection has been offered employees in high noise environments for many years with varying degrees of success. Many times the success is very limited because there were no penalties associated with not wearing protection.

As I have seen the new Occupational Health and Safety Act develop and employers come under its tentacles, I have seen a changing attitude toward dangerous noise exposure. I have witnessed companies pulling together their resources to initiate hearing conservation programs and stating that if employees fail to wear hearing protection they would be fired. I have seen employees buckle under to this approach and accept the hearing protection as a part of life.

It is my feeling that this legislation has been needed for years and is accomplishing its desired goal, even though inspections have not yet begun, to this date.

In industries where the noise problem has been identified but nothing done about it, it is my hope that concrete steps will be taken to protect the most precious of our physical senses, hearing.

Dr. MEYER: Thank you very much.

Any questions, panel?

Dr. OKUN: I'd like to address one question. One of the major problems associated with noise control, noise reduction, is the increased cost of normal operations. In your experience with dealing with large numbers of people and their hearing damage, have you tried to make any assessment of the economic impact on this population and perhaps then extrapolate into larger populations as to what this exposure to noise has meant in more concrete terms than just discomfort and disability?

Mr. GRINDLEY: Are you talking about cost of hearing conservation programs?

Dr. OKUN: Well, that in part, but also perhaps cost in terms of employment, hours lost in employment, or less effectiveness in employment or whatever measures might be used to assess the economic impact of this hearing damage that has accrued to those exposed.

Mr. GRINDLEY: I'm not familiar with records of time lost because of hearing loss, but I am aware of some of the costs involved in hearing conservation programs, and this of course, falls directly upon employers.

Costs for hearing protection can vary anywhere from about 50 cents per pair of hearing protectors, ear plugs, on up to perhaps $5 or $6 for a pair of earmuffs, and costs for him to hear himself.

So over a period of years he becomes a shouter. In return his wife becomes a shouter because she learns to communicate in the same manner. So when the man listens to his television or his radio he has to turn them up louder. His children become used to this loudness and they have to scream in order to be heard.

So you see the man's quality of life, the quality of his family has been impaired, and it's primarily because of this noise exposure that he has had to become accustomed to in his work life.

Dr. **Meyer**: That was very well said, sir. Coming back to the economics, I think what we are trying to come to grips with here is a very difficult problem: in addition to these quality things what does it really cost a person to have a hearing loss? And I recognize the difficulty of trying to quantify that.

Let me ask you a question, since you are an audiologist. You have explained part of this cost, which is really a change of a person's whole attitude, social orientation. But assume the individual has actually gotten to the place where he has an actual hearing loss. Assuming that he still can wear a hearing aid, what is the normal cost to the individual of purchasing a hearing aid?

Mr. **Grindley**: Well, the normal course that a person follows is to first of all see a doctor. There is the necessary cost of seeing him. Then, if it is done properly, he will go to a hearing and speech center for what we call hearing aid evaluation, which generally runs about $30 across the country.

Then he goes on from there to the hearing aid dealer where he spends in excess of $300. And many times a man who has a hearing loss due to noise has a higher loss in the high frequencies, and therefore he has very unsatisfactory experience with a hearing aid.

In many cases—and this is very common—people will wear the hearing aid. Perhaps they were put under pressure to wear it by their family members. And they will wear it for a few weeks, maybe months, and then put it in the drawer and that's the end of that. So you have a financial loss as well as a tremendous psychological burden when the man says, "I'm sorry, I didn't understand what you said," and pretty soon people get to the place where they say, "Well, why waste my time with him when I can spend it so well with other people who can hear me?"

Dr. **Meyer**: Before I defer to my colleagues on the panel, let me ask you one other question, sir. There has been a great deal said lately about an increasing temporary or permanent threshold shift in the younger population of the Nation. Part of this is attributed to loud music of discotheques, and part of it is attributed to just the increasing background noise to which the total population is subjected. Have you any experiences that seem to indicate that we are seeing an earlier onset of hearing loss or more acute hearing loss in the younger population?

Mr. **Grindley**: At present, as I am sure you are aware, hearing testing is accomplished between the frequencies of 250 Hertz on up to about 8,000. We have seen some early research that shows that high noise exposure tends to cause loss where there is no measurement made—that is, 10,000, 12,000, ultrasonic frequencies.

And I suspect that there is an increasing amount of high frequency loss that will eventually work itself way back into the usable area of hearing, and in some cases I see it already developing in the 3,000, 4,000, 6,000 Hertz area.

However, I would like to add one thing. It seems like every time people mention noise they automatically refer to rock. And I think this is probably because parents have a certain amount of annoyance and they want to put the finger on it. But I have tested a lot of people who have worked in these environments, and the important aspect is time spent in this high noise level and proximity to the source.

110 dB is probably the most accurate average measure of rock if you're right close to it. And if you play 4 hours a night or 6 hours a night for every single night of the week for 3 or 4 years, you probably run risk. But an occasional nightclub stint or a visit to a nightclub is not going to do appreciable damage in my opinion.

Dr. **Meyer**: Thank you very much.

Dr. Okun.

Dr. **Okun**: I have a question somewhat related to this. In your experience, most of it apparently, and this is quite understandable, has been with those who have been exposed in their occupational setting. Have you any experience with patients who have come to you and have suffered hearing loss who are in the area of sort of innocent bystanders, those who have been perhaps residents near construction projects or near airports?

In other words, other than occupational exposures, have you run into anything of this sort?

Mr. **Grindley**: No, I have not. Nothing more than a few grievances, but no actually provable induced hearing loss due to being closely associated with a noise environment except in the actual work life. I have seen quite a few cases where they have lost hearing due to work accidents.

Mr. **McCarthy**: Mr. Grindley, if I understood you correctly a few minutes ago, you were saying that the cost of hearing loss is essentially borne by the person who has to suffer the hearing loss in terms of doctor visits, hearing aids, and so. One of the things we have been struggling with for some time here and went through quite a bit of discussion on yesterday is how do you measure the costs of quieting construction equipment and where are those costs incident. And we kept talking about the economic cost of what does it cost to get from 110 dB down to 85 or whatever number.

We kept trying to say, and Mr. Baron was pointing out, that these are not the only costs involved. What about the quality of life effects? And it seems to me here is at least a start on costs which unless I'm mistaken are not borne by anybody except the victim.

Would you care to give us any further thoughts on that or would you agree?

Mr. **Grindley**: Oh, yes, I think the least of our worries—And, of course, I'm not in industry so I can say this. But the least of our worries is costs of lowering noise levels. I know it's extremely costly. I know it's difficult. Every time you cut the power you lower the dB rating 3 dB, and if you keep this up it's going to take a lot of money to get it down to an acceptable area.

But my main concern is the human being and his response to his environment relative to noise, and I see a tremendous lessening of the quality of life of people who have hearing loss early.

Now, I see it normally in older people, and it's expected. But when I see a 23-year-old person come in with significant hearing loss, that just burns me up when I know it's directly related to noise.

Dr. **Bender**: I have a question concerning the success rate of getting people in hazardous occupational areas, hazardous from the point of view of hearing conservation, to wear hearing protectors. Do you have any feel for the percentage of people who are exposed, say, to damage risk levels that do wear hearing protectors and the percentage that don't?

Mr. **Grindley**: I can't give you a figure to hang your hat on, but I can tell you that in the research that I have read and the reports that I have read prior to the onslaught of this new law there was very poor acceptance, and I think that this is in part due to the attitude of the employer: "Here it is. Wear it if you want," you know. "It's for your benefit," you know. And there's not a lot of importance put on it.

Now I see a change. I see them saying, "Look, you wear this or I'm going to be fined $1,000," you see, and they're wearing it, and they're presenting it properly to the employee, using movies that are designed for this purpose, and they are trying to present it from the point of view that "this is a benefit for you to heighten the quality of your life; try it."

And then, of course, they take other steps like forcing them to wear it.

And I see that this is a big improvement over the voluntary "wear it if you want" approach.

Mr. **Baron**: Are most of the plants that have excessive noise levels of a size that can afford hearing conservation programs?

Mr. **Grindley**: Well, there again I'm not in industry and it's hard to tell. But I'm aware of some of the costs of other safety devices, and I know that they are high. And when I look at the cost of a hearing protective device being 50 cents per pair and these can be worn and preserved for some time, I don't think that's an excessive cost for the benefit.

Mr. **Baron**: That isn't what I was driving at. A large number of workers I understand that work in noisy plants work in small plants, 20, 30 men. The question I'm raising is the economics and the reality of having a hearing conservation program.

As I understand it, ear plugs should ideally be fitted—the difference between two ears, and so on.

In your paper you give a feeling that if everybody wears ear plugs the approach of reduction of noise level of machinery and plant is not so important, and the question I'm raising is: If many of your plants are indeed small, too small possibly to have hearing conservation programs that are effective, shouldn't we place more emphasis on the reduction of noise?

Mr. **Grindley**: Yes. I didn't mean to say that I think you ought to ignore reduction of noise at the source. This has been recognized by the law as being the primary place to stop noise, and I agree with that. I'm saying that it's highly impractical, for example, in a loom, in a mill. It's just very, very difficult to bring the level down in the foreseeable future. And right now I see the only answer in some industries is personal hearing protection, but certainly not the answer from now on.

Mr. Baron: Another question. Do you feel that construction noise— Most of the work in hearing loss and occupational hearing has been in fixed installations. Do you feel that the construction industry poses a problem?

Mr. Grindley: As far as noise exposure?

Mr. Baron: Yes.

Mr. Grindley: Very definitely.

Mr. Baron: It has been ignored, if you know, in the past.

Mr. Grindley: Yes.

Mr. Baron: I also understand according to the paper by Dr. Alex Cohen, Public Health Service—I forget his colleague on it—that there is a problem with ear plugs in construction because of the sweating and dirt and so on.

Mr. Grindley: Yes. I foresee that problem also. I have worked in heavy construction work, and I know the attitudes of a lot of the workers, and I feel that this is going to be probably the hardest industry to enforce hearing protection because you get up in a cab by yourself and you pull these things out if they are uncomfortable, and that's the end of it until you get out of the cab again.

So there has got to be a change in attitude toward the quality of life, understanding of hearing and hearing loss, and try to convince people that this is for their benefit.

A lot of people don't care. I heard a man from Liberty Mutual, a doctor consultant, tell me that in New York State in the forging industry it's a badge of honor to have a hearing loss. They say, "I got that hearing loss down at the forge, and I'm proud of it."

That to me is a litle bit warped, and I can't understand it, but he says it's a fact.

Mr. Baron: These are some of the myths that exist that have to be done away with.

You raise a very interesting point on page 2 which I am very interested in—that is, the fact that the definition of handicap leaves room for improvement.

Mr. Grindley: Yes.

Mr. Baron: And I think it's a very important point, because then in the use of ear plugs and other forms of hearing protection we have to consider a safety factor, a margin of safety in terms of the attenuation achieved by these devices.

Would you also have any comment to make about the development of a DRC for the general public? I mean here we see more or less inadequate DRC for occupational hearing loss. Do you believe that the general public should have perhaps a better goal or better objective in terms of retention of its hearing than the one we assign to the working force, industrial working force?

Mr. Grindley: Well, as far as damage risk criteria, the law states now 90 dB, and the medical profession recognizes 85 as being a risk. I would say that any laws made relative to a specific damage risk level in our environment should be kept down to 85 or lower as far as the general environmental level.

Mr. Baron: What I'm driving at is I understand that to hear speech fully that you are able to hear up to 6,000. Is that correct?

Mr. **Grindley**: Well, it's hard to determine exactly. 2,000 and 3,000 seem to be primary frequencies for understanding of high frequency consonants. I imagine the addition of higher frequency sounds would make your understanding fuller, richer, if I may use that word.

Mr. **Baron**: More of the texture of the human voice. So we are talking in a sense about a problem that the criteria we now use really give you the bare bones of speech,—

Mr. **Grindley**: Bare bones.

Mr. **Baron**: —change of relationship to—

Mr. **Grindley**: You can hear it, but it sounds weird, like you're talking in a copper barrel or something like that. And when environmental noises are introduced—say you're speaking at a level of 50 dB and someone turns the V up to 70 and the vacuum cleaner is running—you're out of it. You just can't hear even if they shout. You still miss the high frequency consonants that are masked. So you're out of it until someone turns that thing off.

Mr. **Baron**: So you would agree we should be doing some thinking about a hearing conservation program for the general public that is more liberal, shall we say, and more protective than the one we now have for—

Mr. **Grindley**: I would say that would be a good direction.

Mr. **Baron**: Thank you.

Dr. **Meyer**: Any other comments?

(No response)

Thank you very much, sir.

I would now like to invite Mr. Thomas Muehlenbeck City Manager of College Park to come forward. We're pleased to have you with us, sir.

STATEMENT OF THOMAS MUEHLENBECK, CITY MANAGER, COLLEGE PARK, GEORGIA

Mr. **Muehlenbeck**: Thank you, sir.

My name is Tom Muehlenbeck. I am the City Manager of College Park. The city does appreciate the opportunity to make some type of a presentation before this group this morning. This is in direct connection with the N.O.I.S.E. presentation that was made.

Further, what I would like to attempt to do is to bring down the noise problem to a more local level more in the area of aircraft noise and its effect upon the city of College Park.

The City of College Park is a community of 20,000 citizens. Its physical limits actually abut the city of Atlanta airport on the east side. Landings and takeoffs from this, the third busiest airport in the Nation, cause untold hardship and agony to many of the residents of the city of College Park.

Hardly any area within the city-limit boundaries escapes the resounding noise of jet aircraft engines around the clock. The two areas of the city, however, that are continually bombarded with aircraft noise are those areas that lie immediately in the runway path.

Much of the area that makes up the Atlanta airport that allows construction and extension of the runways lies within the city limits of College Park. That area was developed over an extensive period of time for single-family homes. When the airport decided to expand, these homes were purchased by the city of Atlanta and cleared for airport purposes. The city of College Park has lost well over 10,000 of its residents in the expansion of this airport facility.

With the advent of the jet engine on commercial airlines and the somewhat exclusive use of jet engines by the major carriers in the Atlanta airport, the noise problem has grown immeasurably. The schools which lie in the flight path are harassed daily in such a manner that classes have to be stopped until the airplanes pass over before the classes can resume.

As experienced in many of these school classes, interruptions are so frequent due to the close pattern in which the airplanes depart and land from the Atlanta airport, the entire class day remains a shambles.

Schools in this area also have a great deal of difficulty in hiring and maintaining the teachers for these facilities.

Efforts over many years in an attempt to get the Federal Government involved for the purpose of air conditioning these schools so they could close the windows, which would reduce some of the noise, have been to no avail. Just the past year, however, two of the schools were approved by the county for air conditioning.

The problem even extends to the churches that are in the immediate area. Congregations even have to suffer on Sunday it appears.

Residents that live in this area, therefore, are constantly complaining about the amounts of noise that are being emitted from the jet aircraft.

Gentlemen, I would like to extend this discussion a little bit further and bring the point maybe even home a little bit more effectively in relation to a recent denial by the Housing and Urban Development Agency of an urban renewal program based on the factors of noise, and I will also relate a little bit later to this point.

The city of College Park began in 1960 an urban renewal program. A general study area was adopted and approved by the mayor and council.

If I could take just a moment of time, I would like to show the area that I am talking about on this map. This is the area that I have reference to that is shaded in blue, yellow, and red, which is in the northern part of the community you can see in this area.

Dr. MEYER: Excuse me, sir. Would you mind just turning that a little bit so the audience can see this also?

Mr. MUEHLENBECK: You can see in this area is the southernmost runway, and in this area is the northernmost runway, that I would say actually protrude into the city limits of College Park.

I will hold this up just for the purpose of showing this general area as described here as the area that was established in 1960 for a general neighborhood renewal proposed area. The area that was outlined in blue, the very small portion, was approved as the first urban renewal project for the city of College Park, and it is rapidly being closed out at this time, very successfully I might add.

In September of 1967 the city submitted a survey and planning application to complete the urban renewal activities in the area that was denoted in red and yellow. In February of 1968 the city was notified by HUD that we could not proceed with this project due to the proposed expansion of the Atlanta airport.

In the same letter HUD suggested the city might undertake a feasibility study to determine the feasibility of its urban renewal program. Hence, the Federal Government approved a grant of $101,608 to the city to undertake the subject study. This is strictly a 100 percent grant by the Federal Government, of which a third would be due and payable back to them only if the city participated in a new urban renewal program.

The city engaged Eric Hill Associates, Inc., planning consultants, to coordinate the study. The Georgia Tech—Institute of Technology—was chosen to make pertinent acoustical studies. Mr. Julian (Diaz) was chosen as the market analyst to determine the effects of the close proximity of the Atlanta airport on commericial, residential, and industrial property market.

As a result of the combined findings of said consultants, it was determined in no uncertain terms that it was highly desirable and a feasible to continue urban renewal activities on a modified basis. And, gentlemen, that modified basis would mean the cutting down of the second project area which is demonstrated here on this map. Again this would be the section in yellow.

The area was reduced. Based on the conclusions of this information gained in the subject study, the city submitted a revised project which was accompanied by the feasibility study. This is the $100,000-plus feasibility study. This was submitted in June of 1970 to HUD for their review, for their normal review.

Gentlemen, to make a long story short, on June 1 of this year, 1971, we were advised by the Housing and Urban Development Agency that the urban renewal program would not be allowed.

I would like to just read two or three excerpts here for your consideration. This letter is coming from the Assistant Regional Administrator for Renewal Assistance.

"Aside from market considerations is the environmental consideration. At present people are willing to live in this area despite the unpleasantness of airplane noise because they find the desirability of location offsets the undesirability of noise. Also much of the existing development was done and investments made before traffic at the airport had increased to an objectionable level. It is proper for the private real estate market to continue to build houses in the area if it will and sell or rent the houses at prices or rents which reflect a balance between desirable and undesirable features, but for the Federal Government to subsidize housing in this area through the urban renewal program or FAA subsidy programs would be improper. The quality of life will be adversely affected in various ways.

"For example, despite heavy soundproofing and air conditioning, outdoor living will be curtailed. Also the noise has its ill effects on health and disposition over a period of time even with insulated homes. People should not be encouraged to live in this environmentally unsatisfactory area by the use of Federal subsidies to reduce the cost of living there.

"We recognize the hardship to College Park from our conclusion and regret this. However, we believe we must base our decision on the good of the larger community with its other sites for residential construction.

"We conclude the Federal Government should not fund any programs for the development of residential usage in this area since the environment would be substantially below the quality desirable for human habitation."

Gentlemen, just very briefly, what they are saying is they will not allow Federal subsidy programs, Federally-financed programs, to be utilized in this area.

It's quite ironic that only 60 days prior to us receiving this, FHA approved a 236 unit housing project that is well within this area and not only abuts it but is within this area.

The city feels like it's caught right in a tight squeeze here between governmental agencies, governmental jurisdictions, that are apparently talking out of both sides of their mouth coming back to the same problem of noise.

We feel that if not urban renewal, then the Government ought to give us another avenue to travel to relieve the hardships on the area that were brought about by no fault of the residents of that area.

The Government was certainly a party to the problem in their various subsidy grants, etc., to the airlines and to the city of Atlanta. The people, the citizens, of College Park were there first. We certainly don't want to stop the expansion of the airport. We just want to be able to live with it.

Gentlemen, with some of the brief facts in mind, I would like to just list four things the city of College Park is attempting to do in this area.

No. 1, the city has joined and has taken a very active part in the N.O.I.S.E. organization. We feel that this will be one way that we will be able to press for Federal legislation in the future years.

Secondly the city is considering a very comprehensive noise ordinance.

Thirdly, the city will be in the very near future purchasing testing equipment to register the amount of noise that the aircraft are actually causing over all parts of the city.

And, fourthly, we will continue to press for Federal legislation concerning retrofittings and Federal noise pollution legislation.

Gentlemen, I appreciate the opportunity very much this morning.

Dr. MEYER: Thank you very much.

May I ask if you have copies of that map and your correspondence that we could have for the record?

Mr. MUEHLENBECK: Sir, I will make it available to this group.

Dr. MEYER: Would you, please?

Mr. MUEHLENBECK: Yes, sir, I will.

Dr. MEYER: If you can mail it to us in Washington I would appreciate it very much, because I want the record to be as complete as possible. And I particularly would like copies of the correspondence that you referred to.*

Dr. MEYER: I have several questions, but, panel, any questions?

Mr. BARON: Just one question. Insulation is often said to be, you know, a panacea for the airport homes. I don't happen to agree personally. But you made some reference to HUD stating that insulation is not a satisfactory answer, one reason being given because there is the outdoor life to be considered.

From your own personal point of view, do you care to make any comments on this business of insulation and why you do or do not feel that it is a satisfactory answer?

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* The documents referred to are on file at the Office of Noise Abatement and Control.

Mr. MUEHLENBECK: I think it is a very good point. I do not feel that insulation will be the total factor simply because of the point that was raised by the HUD agency, the fact that the people will be outside of their homes on a number of occasions.

I think the point that is overlooked, however, is the point that is made time and time again in that the efforts of this group, the Federal legislation that is pending, the fact that jets are becoming quieter, if that is palatable at all, do relate that down the road we will not have this problem or to the extent that we have it now through the efforts of many of the groups.

So I do not believe that a program getting turned down simply because of the noise on the outside because it's uncontrollable at this date certain is a justifiable argument, sir.

Mr. BARON: I just wanted to clarify. Are there any other points beside the fact that people go outside that would make objectionable the insulation of homes? You make two points. One is that some day the jets might be quieter so the investment would have been not worthwhile or not necessary at that time. Are there any other reasons why you think that insulating the home near an airport is not an answer to the problem? You have given two. Are there any other? Anything about the quality of life as far as the insulated home is concerned?

Mr. MUEHLENBECK: Let me go a little bit further than what I have said and put out the point of land use as possibly another area. Maybe I am attempting to still skirt around the issue. But I think land use, that was pointed up in the feasibility study that was made, also the arrangement of the structures, would cause the residents of the area not to have the full effects of the noise aside from insulation, sir.

The arrangement of the structures on the property itself would provide some benefits to the people even if they were outside of their structures.

Mr. BARON: I'm not going to quote you, but the impression I'm getting is that there is some feeling that to insulate a home would sort of provide an encapsulated life experience and might to some people serve as a substitute for progress in noise abatement.

Mr. MUEHLENBECK: I'm glad you wouldn't quote me on that, because that's not what I'm saying at all I do not believe. I don't think that we as government officials can sit back and say that this would be the total answer or the answer would be to stay in your home, that this is the only safe place. I think what we are trying to say is there are other alternatives to this insulation.

Dr. MEYER: You're talking, of course, about special insulation for noise? I believe Atlanta is a moderately Southern location in which insulation for protection against the heat might not be inappropriate.

Dr. OKUN: To what extent does the city of College Park have zoning which would in some way direct the construction of schools, churches, and houses away from areas that would be most impacted by the airport?

Mr. MUEHLENBECK: Yes, very, very definitely the planning commission does take items of this nature into effect. However, the only point we can come back to is the fact that these schools, churches, and residential developments were there prior to the advent of the jet aircraft, and it's somewhat hard now after the fact, so to speak, to provide the necessary zoning that is necessary to keep the people away from this noise.

But if we were to do that, if we were to zone out of existence these uses, we would also be zoning out of existence most of the residential area of the city also, sir, that is affected by this aircraft noise.

Mr. McCarthy: I think I heard you say you are considering a comprehensive noise ordinance for your city. Are you in a position yet to comment on the extent of that vis-a-vis national standards or State standards or anything like that?

Mr. Muehlenbeck: No, sir. This ordinance is in the process of being drafted, and all these are being taken into consideration. When I speak of a comprehensive noise ordinance, however, I'm speaking of an ordinance that goes far beyond the aircraft noise. It would be an ordinance that will cover all types of noise within the city.

I don't know how the enforcement is going to come about, how you're going to enforce it with the jet aircraft, but I believe we are going to give it a try.

Dr. Meyer: Dr. Bender.

Dr. Bender: One quick question. You mentioned that 10,000 people moved out when the airport expanded. How were these people related to the airport? Did they all live in the area that the airport expanded into or did some of them move out because they were tired of hearing the planes or did they work in areas—

Mr. Muehlenbeck: No, these people were people that were directly in the airport expansion area.

The study that was mentioned also as a part of a feasibility study has shown that homes in College Park that are in this noise area are very comparable in sales with homes in the metropolitan area that are not in this noise area, that the homes are not having problems in selling. This was something that the Federal Government I guess took with a grain of salt, but we have the documented proof to this effect, almost on a house-by-house basis of comparable size, style, and setting.

Dr. Meyer: In regard to that, because this is very interesting information, would you be able to give us some documentation.

Mr. Muehlenbeck: Yes, sir.

Dr. Meyer: I'd like to have that.

I have a couple of questions. As I said, I am trying to get all the facts I can on all sides of these issues. You mentioned something in a quote about the market situation. You say HUD said "the market situation aside." That could be taken in two ways. One, "there is no real market problem, so forget about it." Or, two, "it could be that you've got a heck of a problem but in spite of that we're saying we can't do anything for you." Would you clarify that for us?

Mr. Muehlenbeck: I believe, sir, it was used in the context of changing the subject was what he was attempting to do here. Aside from the marketing conditions he was going into a new subject at that point.

Dr. **Meyer**: I guess the question I was asking was: Is there a housing shortage in College Park?

Mr. **Muehlenbeck**: No, sir, I would not say there is a housing shortage at all. The statement was at the beginning of a new paragraph. It said, "Aside from marketing conditions is the environmental consideration."

Dr. **Meyer**: The point was made in a Congressional hearing I attended the other day, where a similar ruling had been made by HUD pertaining to a location in which there was a housing shortage, and a request had been turned down on a similar basis. I just wanted to see whether you have a similar problem here.

Mr. **Muehlenbeck**: We were experiencing a great deal of growth as most metropolitan Atlanta is, not necessarily in single-family homes but in apartments.

Dr. **Meyer**: As I said, I wanted to get that clarified so we know exactly what we were talking about. You raised another point on which I would like to at least get your view. I was visited the other day by a gentleman from Japan representing a similar group to N.O.I.S.E., and he pointed out that in that country in the development of airports and airport operations they have established, because of the difference in their Federal national structure, a compensation provision. This provision allows, if noise is impacting the properties adjacent to an airport, that rather than condemning, requiring people to move, or restricting further development, the people are provided, in effect a subsidy if they want to stay.

I got a feeling from something you said that some of the people might want to stay there anyway and if it were a lower cost private property that maybe people would. Do you feel that we should look into this question? It's not really damages now, you realize. It's sort of a subsidy. I have some feelings against that approach. As a local governmental official how would you feel about that approach?

Mr. **Muehlenbeck**: I would certainly not suggest the subsidy approach. I'm afraid I'd have to back up on another term you used, which is damages. I feel there are some very real damages here in this area.

Dr. **Meyer**: Thank you very much. I think your statements have been extremely useful, because we need to get the view of the big city and the little city, too. I would appreciate your sending that material.

Mr. **Muehlenbeck**: Thank you, sir.

Dr. **Meyer**: Is Mr. William Doughorty of the American Institute of Architects here? Please come forward, Mr. Doughorty. We are happy to have you here.

STATEMENT OF WILLIAM J. DOUGHORTY, NORTH GEORGIA CHAPTER, AMERICAN INSTITUTE OF ARCHITECTS

Mr. **Doughorty**: I have an extremely short statement to read from AIA.

Dr. **Meyer**: Very good, sir.

Mr. **Doughorty**: I am with the North Georgia Chapter of the American Institute of Architects. I am Chairman of the Ecology Committee of this Chapter. We represent approximately 485 members and 125 firms in North Georgia.

The statement is thus: We as a chapter of the American Institute of Architects have not considered the problem of sound in any specific categories and are not prepared to offer any specific solutions or recommendations other than to state that we believe that sound abatement standards should be established.

For the record, we believe these hearings are important and that due to the very short notice of this, the Atlanta hearing, we hereby formally request that scheduled hearings around the country be held and not be influenced by the success or failure of this one.

Thank you.

Dr. MEYER: Thank you very much, sir. We are hopeful that the AIA will be present either on a regional or a national basis at the hearing in Dallas, which will be dealing with the problems of urban planning and noise in the home and architectural arrangements. We realize that the Institute has an interest in construction since it helps design things. We were hopeful that you would at least be here today and say as you have. And we are going to have about 6 weeks from now, considerable input from the architects in the Dallas program bacause we feel it's a very important element of your professional concern. I appreciate your coming.

Mr. BARON: Let's take advantage of you while you're here. I'll just ask you this question which I am sure will be gone into in greater detail in Dallas. That is, what can the architect do in terms of construction? I'm not talking about design of the structure itself but the construction phase, which is our main consideration here. How much influence do you have in the builder's specifications? Let's say we wanted quiet put into the specifications during demolition and excavation and erection processes.

Mr. DOUGHORTY: I believe this is why I stated that I feel that standards should be set, some standards should be set, so that then the problem is given to us on how to solve the problems.

Our work directs itself to codes and standards and economy, and without having this criteria, without setting it arbitrarily ourselves, we have nothing to work towards.

I believe that the architects can or will put forth the very definite effort of new ways of doing things once they have some type of goal they have to meet. I think we can do it. What exactly these things are I don't know.

A gentleman stated last week he has been asked to use rubber hammers.

Well, with the various construction techniques and using the materials we have to work with and the equipment we know that the contractors have to work with, we will have to devise methods of doing it. I really don't know at this time what they would be.

Mr. BARON: I'll give you a "for instance." Like yesterday it was revealed here at the hearing there are quieter compressors. Could an architect use his infiuence in this way at this stage of the game without any city laws or State or Federal laws—

Mr. DOUGHORTY: Oh, certainly.

Mr. BARON: —to recommend these?

Mr. DOUGHORTY: We write the construction specifications. In those specifications are performance specifications. We include safety regulations which may or may not be required by law locally or whatever where we are working. We require cleanup regulations to keep the city clean and safe from noise.

You say "noise." We just say "noise." We don't know. You go out and say, "You're too noisy." They say, "What's too noisy?" And you can't tell what "too noisy" is at this point.

But when I say "too dirty," that that pile of junk there is too dirty and get it away from here, we can certainly control this. And we have the methods, the construction documents, which are the legal documents for the construction of the facility. We have the tools to enforce a standard if we had a standard.

Mr. BARON: You do have one in the Occupational Health and Safety Act, for example, that goes into effect the end of August, which refers to Walsh-Healey, as far as hearing loss is concerned. So that in a construction project you may have some tools there that we hope will spill over—not spill over but protect the environment too.

But, anyway, thank you too. I think you have answered the question that the architect can indeed play an important role in the specs that will influence the construction phase of the operation.

Dr. MEYER: Following up on that, one of the things we hope to do with the architects, the professional engineers, and Association of General Contractors is arrive at some meaningful guidelines in this area, and we intend to do this in a highly cooperative manner. Do any other panel members have a question?

Mr. BARON: May I just clarify one other thing? In relation to the cleanup operations, and we'll say there were a noise standard, would the architect be the person for liaison before the contractor in terms of a specific construction project? Would he be a good person to have liaison with prior to contact with the contractor if there are problems?

Mr. DOUGHORTY: You mean in an effort to set the standards or set criteria?

Mr. BARON: Well, where a standard is not being met or there is a problem.

Mr. DOUGHORTY: Well, I think yes and no. The contractor has to be included because he knows what his limitations are, and we can set limitations on him whereby he cannot build what it is that he has to build. I think the architect is the first person to contact, but I think the contractor has to be included almost immediately in what's happening because he knows—

Mr. BARON: But the architect should be contacted?

Mr. DOUGHORTY: Oh, definitely. And as soon as these things are done I know that locally we will have committees set up and study committees set up and go right into it on a chapter basis. But until this time we have not done this.

Now, there may be individuals within this chapter who know much more about sound abatement than I do at this point in time, but I don't know who they are. There are people who know much more about decibels that I know but I don't know who they are. But once we have this regulation or have something to go by, we can pull these people out and develop something very quickly I think.

Mr. BARON: Thank you.

Dr. MEYER: Thank you very much.

Is Mr. John Glenn of the Citizens for Clean Air present?

(No response)

Since Mr. Glenn doesn't seem to be here, is Mr. Glenn Bennett of the Metropolitan Planning Commission here?

(No response)

In that case I shall proceed to the next gentleman who has asked that he be heard, Mr. Jack Benson. Would you kindly come forward, Mr. Benson? Nice to have you with us, sir.

STATEMENT OF J. M. BENSON, COLLEGE PARK, GEORGIA

Mr. Benson: Sir, I think I feel about as invited to this meeting as one can get. I don't know that you recall it, but I have a letter from you inviting me.

Dr. Meyer: Good. That's right.

Mr. Benson: I have a letter from Congressman Fletcher Thompson inviting me and a telephone call from Mr. Smelley who urged me to come. So here I am.

Dr. Meyer: I recollect your letter, sir, and I think we said, that since you had some strong views on the subject we would be very happy to have you come and air them in public.

Mr. Benson: Thank you, sir.

This testimony is given from written material so that there will be no question as to what was said. Two exhibits are offered in connection with this testimony:

First, the publication to which Mr. Smelley referred, the official minutes of the First National Symposium on Jet Noise, Los Angeles, California, January 20, 21 and 22, 1971.

Second, file of correspondence dating back to 1962 with various officials and agencies at the local, State, and Federal levels.

So I have not been idle in this matter, sir.

Dr. Meyer: Thank you, sir.

(The material referred to follows:)

Mr. Benson: The noise level of a jet aircraft on takeoff is equal to or in excess of 120 decibels, for beyond the ability of normal human beings to withstand. Just prior to touchdown on landing, the screaming, whining, unbelievable noise is accompanied by a pall of dense, black smoke, followed by miniature tornadoes of incredible velocity which twist trees and lift shingles from rooftops. And I add here, sir, this is personal observation.

This testimony is presented on behalf of a once peaceful community named Newton Estates in College Park, Georgia, located less than 1 mile from the west end of runway 9L/27R at the newly designated Hartsfield Airport. This community of more than 1,000 homes is being systematically, sadistically, and utterly destroyed by noise and smoke from monstrous jet aircraft which passing just overhead make a shambles of our homes, a mockery of our attempts at Christian worship, and a hell on earth of our physical and mental lives.

Each individual aircraft is controlled and directed by an agency of the Federal Government—namely, the Federal Aviation Administration. The noise and smoke pollution described above are an ugly, cancerous blight on our existence 24 hours a day, 7 days a week, and we are literally being annihilated in a vicious maelstrom of hellish noise and suffocating smoke.

In the broad-brush treatment, nearly everything that could be said here has been adequately covered in the official minutes of the First National Symposium on Jet Noise. There are, however, at least three pertinent points which are of such importance as to merit separate recognition in this public hearing.

In the first place, anyone who would move anywhere near a modern-day jetport is either (1) densely and hopelessly ignorant, or (2) out of his mind, or (3) completely immune for some reason to dehumanizing noise and smoke pollution, an unlikely occurrence.

Many of us in the Newton Estates community, however, have been unwittingly entrapped by a condition not of our making, utterly repulsive to normal life styles, and about which we have been unable to do anything to extricate ourselves.

In my own case, nearly 21 years ago I moved with my family into the middle class neighborhood described above. There was an airport "way over yonder in the woods," but nobody paid much attention to it, and it was a good neighbor. Propeller planes flew over but were accepted with a shrug.

Over the years, especially since 1962 with the advent of jets, this former good neighbor has become an engulfing monster which has moved its massive, devouring maw to all practical intents and purposes right in my yard, with the encouragement, blessing, and financial backing of the Federal Aviation Administration, to a point where it is now in, around, above, and on my property.

I am now located—certainly not by choice but by substantially illegal confiscation of my property—within 1 mile of the west end of runway 9L/27R of the Hartsfield Airport.

Secondly, 9 years ago I began my protestations for relief from this intolerable, inhumane situation. As of this date, nothing. Absolutely nothing. Those agencies purportedly dedicated to protection of the rights and very lives of citizens at the local, State, and Federal levels are by and large abysmally negligent where noise pollution is concerned.

Having repeatedly appealed to the city of Atlanta government for redress, I regret to report that while Mayor Allen did respond with some diffidence, Mayor Sam Massell has displayed a complete and total lack of interest in the problem. Not once has he ever responded to any of my letters. The same is true of the Atlanta Board of Aldermen.

I quote from an insulting reply received from Grady Ridgeway, airport manager: "You have requested that there be no expression of sympathy. We offer you none."

It is more than apparent that inasmuch as the Newton Estates citizens are not Atalnta residents and therefore not subject to the repressive Atlanta taxes, we are less than cattle in the view of Sam Massell and his aldermanic board.

At the State level, there is a complete denial of any responsibility and none is anticipated. Insofar as expecting any assistance from the State is concerned, forget it.

Now let's come to "Big Brother," the Feds. The one agency which by all that is right and just should be the protector of citizens' rights in this desperate battle for survival is a total, dismal, inexcusable flop. I refer to that defender of commercial aviation, the Federal Aviation Administration, which is the "Johnny-Come-Lately stepchild" of the Department of Transportation.

In being as brief as possible under the circumstances, here are two references to results of my contacts with FAA at both the local and Washington levels:

At the local level, the Deputy Director of the FAA Southern Region threatened me with personal prosecution for having the unthinkable audacity to press my grievance with him by phone at his home, although at the same time his agency is destroying my home and my life 24 hours a day every day.

At the Washington level, I quote from a letter written only because a response was requested by Congressman Fletcher Thompson. This letter is dated 29 June 1971, most recent I assure you, signed by John H. Shaffer, Administrator of the FAA, states in part: "The Southern Region is considered to have exhausted all procedural relief techniques on your behalf and we regret that we cannot offer any further substantial assistance toward the alleviation of your problem."

Let's examine that "highfalutin'" statement a moment. What it really means is that the FAA Southern Region has done absolutely nothing, a big fat zero, in the 9 years of my protestations, to "alleviate" my problem. Furthermore, John Shaffer is saying bluntly that FAA at any level has no intention of doing anything at any time at any place to correct this gross injustice.

A good summary of FAA's negative attitude is contained on page 80 of the N.O.I.S.E. publication referenced above: ". . . there is only one way you are going to hit the FAA and that is in the pocketbook. They are not going to be responsive because they don't give a damn except about the airlines because their concept of themselves is to promote aviation and you can't be both a promotional, developmental agency and a regulatory body."

This is the Federal Government agency that controls and directs aircraft over my home, my church, and my community unceasingly, day and night, hoping we'll go insane, or die, and then we won't be "bugging" them.

Thirdly, and finally, I have no intention of "throwing in the towel" in this life or death struggle. I started with the city of Atlanta in 1962, with the advent of jet aircraft. I have now worked upward to Congressional and Cabinet levels, and as time permits and the Good Lord is willing, I fully expect to continue right on up to the top, step by step, to include each justice of the Supreme Court individually, and the President.

I am convinced that somewhere along the line somebody in authority is going to take notice of this shameful violation of the basic tenets of the Bill of Rights—namely, the right to life, liberty, and the pursuit of happiness. Try pursuing some happiness with jet aircraft a few feet overhead.

If this unspeakable noise and smoke violation is permitted to continue for a much longer period of time, then I say without fear of successful contradiction that we are much nearer to the brink of chaotic, dictatorial "Big Brotherhood" than anyone now suspects.

There is a new hope now that finally somebody—namely, the EPA—and you won't find that on your copies; I added that in because here we are—is interested enough in the disastrous effects of noise and smoke on human beings that a public forum is conducted so that citizens can express their more than strong feelings.

It is all too clear that the city, the State, and the FAA at the Federal level are going to do absolutely nothing unless and until they are forced to take positive action. I look forward eagerly to the day when that force is applied. Thank you.

Dr. MYER: Mr. Benson, thank you very much for a most explicit description of a major environmental problem, and I can assure you the Environmental Protection Agency is vitally concerned with the situation that you described. For the record, however, I think I must point out a couple of things that, as a Federal official, I feel obligated to say.

First, the inference is that the Federal Aviation Administration is doing absolutely nothing about noise control. As a matter of fact, up until last year the Federal budget on noise control was running about $10 million a year, of which over 90 percent was being devoted to the problems of aircraft noise control, aircraft noise abatement, and better design. This is an attempt to come to grips with the fact that we have a monster on our hands and that something has to be done about it.

I realize that doesn't sound like a lot of money, but almost $9 million has been expended by the Department of Transportation and other elements of the Federal Government. Last year that rose to some $30 million. Again, 90 percent of this is to aircraft noise, which represents a tremendous increase in Federal expenditure—your money really—to deal with the problem that you are describing.

Now, I agree with you that that is not a very good answer to anybody who is living in proximity to an airport, but I don't think the record should be silent and let it stand that absolutely nothing is being done, because I happen to be aware that it is. Furthermore, the Department of Transportation has sponsored an interagency noise abatement program for aircraft. And all the various elements of the Federal Government are involved.

It was pointed out by the mayor pro-tem of College Park that he is aware of the fact that the Department of Housing and Urban Development is serving as the chairman of a panel dealing with the problems of noise in housing, not only aircraft but all forms of transportation. So I wouldn't want the record to stand silent and make it look like "big brother" is just completely ignoring the problem.

What we have to come to grips with is the fact that the airport is there, that it is operating in certain ways, and that we have got to figure out ways to solve your problem.

The Environmental Protection Agency under the proposed legislation now pending in the Congress will be given the authority to coordinate all Federal activity in this regard. It would also be given the authorities, which some people at N.O.I.S.E. don't think go far enough, to, in effect, have a veto authority over the FAA insofar as rules and regulations are concerned. And, in fact, the Administrator of FAA, in testimony before Congress on this legislation earlier this month, has indicated that he would be perfectly willing for EPA to be setting these standards.

So I realize that there is a problem, and I am deeply concerned as to how we help solve this matter. But I am also aware of the fact that significant action is being taken.

In the interest of fairness here, since I feel an obligation of fairness, I happen to be aware of the fact that the Federal Aviation Administration does have one of their representatives in the audience, and I just feel that if he would like to take about 4 or 5 minutes in his defense, I am perfectly willing. I don't think you'd object to that.

Mr. **Benson**: No, sir, but I would like to respond to what you said if I may.

Dr. **Meyer**: Yes indeed.

Mr. **Benson**: That is to this effect: A famous orator once said, "Gentlemen, I have but one lamp by which my feet are guided, and that is the lamp of experience."

Dr. **Meyer**: True.

Mr. **Benson**: And, sir, I invite you to spend the night with me one night and tell me what has been done.

Thank you.

Dr. **Meyer**: No, I'm not saying you don't have a problem. I just wanted to indicate that we are spending a lot of money trying to solve it, and I am not justifying the fact that nothing has been done about your problem. I am saying we have to do something about it. And I agree with you there is a real need.

Is Mr. Rickard here?

Mr. **Rickard**: Yes, sir.

Dr. **Meyer**: If you would like to make any comments, please do so, or if you want to defer or want to submit something for the record, feel free.

STATEMENT OF JAMES RICKARD, AIR TRAFFIC DIVISION, SOUTHERN REGION, FEDERAL AVIATION ADMINISTRATION

Mr. **Rickard**: Well, sir, I'd say this:—

Mr. **Benson**: Would he like to come forward?

Dr. **Meyer**: Mr. Benson, why don't you stay there, because several of the panel members may want to ask you some questions.' We want to get your views into this record because they are very important.

Before we go on, Mr. Rickard, I am going to take the liberty of asking Mr. Benson if I may use his statement in our Chicago hearings.

Mr. **Benson**: I would appreciate it very much if you would.

Dr. **Meyer**: Thank you very much.

Go ahead, sir.

Mr. **Rickard**: My name is James Rickard. I am with the Air Traffic Division in our Southern regional headquarters here. I have a title of regional noise abatement officer. That's more of a title than anything else because most of the problems dealing with noise are being handled by our air traffic control facilities such as the Atlanta Tower here at the Atlanta airport, Miami Tower, and other locations where we have noise problems.

I am aware of Mr. Benson's problems very much, because I have been involved in answering many of his letters. And I'll only say this: I feel like that the things he has presented to the panel today have been presented to us on several other occasions and we have to the very best of our ability answered his questions and answered his problem and have done all that we can do at this level.

Now, you have very well expressed what the Agency is doing in the way of noise abatement, and I couldn't really add anything to what has already been given to Mr. Benson in our letters to him concerning his individual problem.

Dr. **Meyer**: Thank you very much.

Mr. **Benson**: May I ask—

Dr. **Meyer**: One other thing, Mr. Benson. I am personally going to discuss this particular communication with the Director of Aircraft Noise Abatement, Mr. Foster, of the FAA, so it's not just a sterile exercise we're going through here.

Mr. **Benson**: Sir, may I ask Mr. Rickard a question?

Dr. **Meyer**: Yes.

Mr. **Benson**: Mr. Rickard, about a year or so ago I wrote a letter to Mr. Jack Barker who is the Public Relations Director of the FAA Southern Region. He never responded. Do you have any idea why?

Mr. **Rickard**: No, sir, I can't speak for Mr. Barker. A copy of this letter may be in our files. I would have to research it and see. But I would be glad to talk with you after this meeting privately concerning this particular letter. If it got lost, of course, that is unfortunate. But we'll look it up and see if we can find it.

Dr. **Meyer**: Panel?

Dr. **Bender**: Mr. Benson, I certainly sympathize with your situation and admire your persistence in trying to get something done. You must have very strong motivations for being willing to live where you live, to continue to live where you live, and to pursue this activity. Just what does motivate you to stay in your house? Why don't you move?

Mr. **Benson**: I was afraid you weren't going to ask that question. In fact, what he's saying I believe, sir, is: Why don't I move? That's putting it bluntly.

Dr. **Bender**: Right.

Mr. **Benson**: I moved into my house 21 years ago, as I stated, almost 21 years ago. It's the biggest investment of my life. It's not a mansion. It's a very humble dwelling. It's the only thing that I have just about paid for. I own it. And, God willing, I'm going to keep it. That's the No. 1 motivation.

No. 2 motivation, I'm in this battle because I believe it's a battle for right, and I don't believe that any governmental agency, be it local, State or Federal, has any right—and I'll include the commercial agencies, the aircraft industry—has any right to confiscate my property as they have done.

The other day we were looking up as we do occasionally when aircraft go by, having experienced this once in a while. A 747 was landing. And it just kept on landing right over my house. And it seemed that you could just reach up and touch it.

Now, my motivation in staying and fighting this battle is not only for myself, although I admit I'm selfish about it, but also for the community and for the Nation as a whole. I think this is a battle for survival against noise. And I'm in it to stay.

Now, you ask me the same question my wife keeps asking me: Why don't you move? And so far I have prevailed, but I don't know how much longer.

Does that answer your question, sir?

Mr. **Bender**: Yes, thank you.

Mr. **Baron**: On the question of ownership, I would assume that you are familiar with the legal aspects. In other words, from the way you described your situation, you may fall under the constitutional taking provision, which means that you would have to be reimbursed for your home. I don't remember all of the legal aspects. Perhaps somebody here could probably clarify it.

But it has been in several cases, as you well know, established that if flights are low enough and frequent enough so that your normal use of your property is denied, that this is a violation of the Constitution.

I'm wondering if you have explored that area and if it has any significance to you.

Mr. **Benson**: Sir, I thank you for asking that question. I have. The latest thing I have from FAA is a, shall we say, permission to sue them in a Federal court within 6 months from a date in April. And I intend to do so, but with a little extra slant. I am going to use a government lawyer.

Now, I have asked the FAA to furnish me such a lawyer, and going through Senator Talmadge the latest letter I got, which was this week, was a refusal to do so. I am now going to the Department of Justice and see why.

I have no funds to engage a lawyer for such a thing as this. You can look at me and tell I'm not rich. But I'm going to pursue this thing, and I believe that I'm right and correct in it, and I'll hope to be able to respond to you that I have won the case.

Mr. **Baron**: What is it you would be seeking? Injunction or financial damages?

Mr. **Benson**: I asked in the letter that I wrote to Mr. Ruckelshaus for an injunction to close the west end of 9L/27R. Of course, Mr. Ruckelshaus didn't respond, but Dr. Meyer did.

And I wouldn't care too much about an injunction to close that runway except that it would prove my point that I am right in this thing and that the rights of citizens cannot be trampled upon in this manner. If it would prove that point, I would ask for an injunction.

Otherwise I want fair and just damages.

Does that answer your question, sir?

Mr. **Baron**: Would the damages be such that you would continue to live there or to make it possible to move without losing your investment?

Mr. **Benson**: That's a good question, sir, and I have thought of it many times previous to this time. Whether I would consider continuing to live there would be based upon one of the motivations that I gave Dr. Bender—that is, how strongly I feel about this whole matter and, more importantly, if my wife would put up with it.

Mr. **Baron**: Thank you.

Dr. **Meyer**: With regard to the legal support, have you contacted some of the environmental activist legal groups such as Environmental Defense Fund? As a matter of fact, one of the important things that's going on now, as you know, is that in some of these areas of great interest and concern getting these matters into courts and getting decisions is one way of helping reinforce the provisions of the Constitution.

While I don't necessarily advocate that all problems should be solved in the courts—in fact, that's one of the things we hope to do with our rules and regulations is to avoid this—it would seem that because of your strong feelings in this it might be useful to obtain their help. Have you discussed this with any of these organizations?

Mr. **Benson**: Sir, I have never heard of that. I appreciate your bringing it to my attention. I will be glad to go into this. May I get some further information?

Dr. **Meyer**: Yes, I will be happy to see to it that we give you some information on this.

Mr. **Benson**: Thank you, sir.

Dr. **Meyer**: I think it's in the interest of all concerned that these matters be resolved in ways that are available to the citizens. Any other questions, panel?

Dr. **Lyons**: Yes. Have you any documented evidence as to how much the property values in your section of town have been affected by noise?

Mr. **Benson**: Let me give you a specific answer to that, sir, and I speak only of my own property. My wife finally talked me into getting our house appraised with reference to a possible trade, and I had a real estate dealer come in. And the real estate assessment was devalued approximately 20 percent based upon the proximity to the airport.

In addition to that, I live in Clayton County. There is a little jut that comes up in College Park which is in Clayton County. And I have gone to war with Clayton County because of the assessment upon my property and the fact that I live in a hazardous area. Our lives are in jeopardy constantly. And I have received a reduction of about—I won't say this as a bold statement—of about 20 percent in my assessment because of the area in which I live.

Dr. **Lyons**: Thank you.

Dr. **Meyer**: Thank you very much, sir. We appreciate this. And I assure you that we are most interested in this problem and will follow up on it as much as I can within the authorities that I have.

I understand Mr. Bennett, the Director of the Metropolitan Planning Commission, is here. He was patiently here yesterday. Mr. Bennett, it's a pleasure to have you here, sir, and I look forward to hearing from you, sir.

STATEMENT OF GLENN E. BENNETT, EXECUTIVE DIRECTOR, ATLANTA REGION METROPOLITAN PLANNING COMMISSION

Mr. **Bennett**: Thank you, Mr. Chairman. I was not here yesterday.

Dr. **Meyer**: I thought you were.

Mr. **Bennett**: I thought I was coming yesterday but I didn't.

Mr. Chairman, my name is Glenn Bennett. I am Executive Director of the Atlanta Region Metropolitan Planning Commission, a position I have held for 11 years.

I don't have very much to say, but I want to speak a little bit about planning and the effect that I think the present situation has with respect to the environmental questions, especially noise.

We are concerned primarily with physical planning. The emphasis is on land use, transportation, airports, water and sewer facilities, open spaces, housing, solid waste management, and so on.

As a part of the planning process a great amount of information is collected, economic and social data, and so on.

We have 45 municipalities in this region. We have five counties and soon will have two more added and some more municipalities.

This is a hodgepodge of governments. There is a unity in a sense in the business and industrial activity we have in this complex, but there is less than unity in the management of metropolitan affairs. This is not just true in Atlanta but it is true all over the country.

I'm trying to point up here how difficult it is to make a metropolitan decision. If we had made metropolitan decisions instead of local decisions earlier, even 10 years ago, we could have avoided some of the unpleasant situations you have been hearing about recently.

I'm very familiar with this situation in College Park. We have bought College Park, almost all. In just a few more years we'll buy all the rest of it. The city will.

The airport management, the airport planning, aside from quite a bit which we do and cannot really enforce— The main activity is a city activity. The airport is a regional facility and should be dealt with on a regional basis. The decisions about land use, water and sewer, other environmental questions really are regional questions, and we have no mechanism yet to make regional decisions except through the State which shies away most often.

So to improve metropolitan decision making we have to have metropolitan government for metropolitan questions, not metropolitan government for everything but metropolitan government for the big things that have regional significance.

Now, so far as noise is concerned, the planners in the past have not paid very much attention to it except at airports. We have worried a lot about this problem you have heard about today. And you could talk about the schools in Clayton County. And I don't know for certain but I believe very strongly there is a generation of children there whose hearing is permanently defective to a certain extent as a result of the very bad situation they have had in the schools with respect to noise.

The highway planners have not paid very much attention to noise until recently. They are doing a lot of it now and doing it pretty well I think.

The planners as such, urban planners like myself, have not known exactly how to go about this on a comprehensive basis, and that's one of the reasons I wanted to come here to speak briefly. I don't think we have given sufficient priority to a lot of environmental factors, particularly noise, because we don't know exactly how to deal with it.

I think out of these hearings should come some guidance to the planning profession, and I think the discussion here will make a valuable contribution.

The question of the airport is real serious.

Now, everything is cost-benefit in the way of regional improvements. We have a tremendous $2 billion price tag that we estimate on regional improvements needed before 1975 in this area, and you don't quite know where the money is coming from in every case. It's coming from the Feds and the State and the locals, but also it brings up a question of how you're going to get these facilities built, and so the cost-benefit ratio comes in there in every environmental consideration.

And every benefit has a cost. Where do you draw the line?

Insofar as the airport is concerned, one of the major decisions that the metropolitan area needs to make soon is the location of a second regional airport. We tried to do this. We have been trying to do it for the last 2 or 3 years. Political and other considerations have stopped the whole thing. And we either have got to buy College Park and East Point and everything elese around there or take the bull by the horns and go out and get a new site.

Now, when we talk about moving the airport—not moving it but when we talk about saturating it and opening up another airport—the community around the present airport objects strongly because they believe that's going to hurt their economy. And you will find some citizens in College Park and East Point who say the noise of the airplane is pleasant because it means economic well being.

So I could go on, Mr. Chairman, but I think you get my point.

Dr. Meyer: Fine. Well, I think one of the things that you have pointed out here, which is something I should have said earlier myself, is that you can't deal with the noise problem in isolation from the other environmental concerns. We have a specific interest. But this is one of the reasons the Environmental Protection Agency was created, to provide a unified approach to all the various environmental problems. And I think you also have laid down a challenge I know Mr. Ruckelshaus and the key staff of EPA are acutely aware of—that we do need to provide better guidance to the planning professions in given areas. And I made a note to be sure and remind ourselves of this.

You also alluded to trading off of one problem for another, and I thought of it yesterday when we were hearing about the fact that there is a lot of noise from a machine that is being used to reduce junked automobiles. We are dealing with a solid waste problem but are also creating another environmental insult. So you have to look at the systems approach in this. Panel, any questions?

Mr. Baron: I was just wondering in terms of noise— You said that the urban planners haven't known how to deal with it. Have you had any experience or tried to have any experience with any noise control expertise in the area?

Mr. Bennett: Only with respect to the airport. We have tried to measure the noise levels in the various parts of the metropolitan area that are affected by the present airport and by the other lesser airports. That is the only experience that my agency has had. There are others in town. We have several local planning departments, but to my knowledge they have not done very much.

Mr. Baron: Have you had any interest in construction noise at all in terms of having seen some input on that as a problem?

Mr. Bennett: My own agency has not had any interest in local construction noise because it hasn't been recognized as a regional problem you might say. And to my knowledge the local planning people have not done very much either.

Mr. Baron: Would they come in though under highway noise?

Mr. Bennett: Yes, highway construction.

Mr. Baron: Highway construction noise?

Mr. Bennett: Yes. Highway construction noise, and highway traffic after it's finished. And we have advocated sunken expressways in metropolitan urban regions for a long time.

Dr. Meyer: Any other questions?

(No response)

If not, I would ask Mr. John Glenn, Citizens for Clean Air, to come forward.

Mrs. JONES: May I ask the gentleman a question, please?

Dr. MEYER: Yes, ma'm.

Mrs. JONES: I'm Mrs. Wirt Jones, and I would like to ask you, sir: There are many problems right now with highways in the city, and I would like to ask in what way there have been any changes made in the planned highway construction which you mentioned being taken into account in the planning.

Mr. BENNETT: Well, we are trying to locate Stone Mountain Freeway right now, and the highway department is expending a lot of effort and have several competent consultants working on it. Maybe somebody from the highway department is here who can add to what I'm saying.

Mrs. JONES: In consideration of the citizens who are going to have to put up with the noise?

Mr. BENETT: Yes.

Mr. HASKELL: May I say something?

Dr. MEYER: Would you introduce yourself for the record?

Mr. H. G. HASKELL: Yes. My name is H. G. Haskell. I am Chief of the Environmental Planning Section of the Planning Division of the Georgia State Highway Department.

I know there was quite a bit in the remarks that were made by this young lady on my right earlier in the day with respect to noise as far as highway noise is concerned. The Georgia State Highway Department is very cognizant of the fact that noise is a factor in the total environment and must be considered in conjunction with other environmental factors in the making of our environmental impact statements.

In order to accomplish this mission and to attack it properly, in those areas where the greatest controversy appears to exist—and of course we do not have the means in the strictly rural areas right now for doing this—but in the relocation studies of I-75 on Lake Allatoona we have employed the consultant firm of which Mr. Bender is a member that has participated in the environmental statement for that particular project.

We have in our studies of proposed tollways in the Atlanta metropolitan area employed Griner Consultants who I believe also are associated somewhat with Mr. Bender's firm for noise input.

Se we are not only seeking the assistance of the experts in this particular area but their input into the environmental impact, to be considered again in connection with all other matters, but we are also within our own section, the Environmental Planning Section, with the knowledge we gleaned from the study of documents that we read that have been prepared by experts, tried to ascertain what effect noise will have in the construction of any highway facility and to try to do our utmost to have our designers design our highways to minimize the adverse environmental impact of the noise to the extent that it can be lived with.

Does that answer your question?

Mrs. JONES: Not really.

Dr. MEYER: Could I ask you a question? Is it not true that under the amendments to the Highway Act enacted this past year you have to hold public hearings even in advance of your environmental impact statements?

Mr. **Haskell**: Yes. The recent issue of the National Register—I don't know the number of it—which we did have an opportunity to comment on before it was put out. We, of course, operate under instructions that are issued by the Federal Highway Administration, which is, of course, part of the Department of Transportation.

The requirement of the National Register—and we will shortly be receiving I presume additional implementing instructions from the Federal Highway Administration—requires that an environmental statement be made available at least 2 weeks prior to the going to a public hearing, and I am speaking primarily of a location public hearing for a new facility or a combined public hearing if such is deemed appropriate for a facility where both design and location can be considered simultaneously.

With respect to the new location of I-75 over the controversial Lake Allatoona area we are in the process at the present time of preparing and distributing a new draft environmental statement incorporating the expertise which we have received from both Bolt, Beranek & Newman as well as other activities in the environmental field.

This environmental statement will be made available to the public at specified locations that will be announced in conjunction with our legal requirement of a public hearing which is being scheduled in August again for this location of this highway facility.

Mrs. **Jones**: The highway department it seems— It is my understanding that the Department of Transportation has arbitrarily set a time on the completion saying that highway plans completed before a certain date would not have an environmental impact study done, No. 1. They have refused to take into consideration or to do environmental impact studies on various highways in Georgia and in the city of Atlanta, one of which is presently in the courts.

The people's wishes are not being taken into consideration. The highway department is planning the highways as they so choose and putting them where they so choose and giving possibly token hearings. The citizens are not really taken into consideration.

We have many highways in the area where people are unhappy now. There are several in Decatur. And the citizens are really not being given consideration. I-75 was only brought into this because of the great pressure from conservationists and something like 11,000 letters written to the Department of Transportation to proper authorities. This is what they have to do in order to get any real consideration.

These impact statements when done— The highway department's original impact statements or assessments or whatever on I-75, if I'm not mistaken, were rejected. They are often token when done. We are not given any real serious consideration in the planning.

We are concerned about having more and more highways in the city, and we are concerned about alternate means, and the noise is one of the greatest considerations.

Dr. **Meyer**: Well, I can't comment on the past, but let me say that the point that I was trying to bring forth here was that under the act of Congress that has just been passed and about which I was asking a question, is the new rule of instruction to meet the criticisms that you are raising—namely, that instead of giving this a token effort they must have the public hearing and they must distribute their proposed environmental impact statement, which is not "the" environmental impact statement. It is only the proposed one. Apparently they are planning to comply.

Mrs. **Jones**: I have read the guidelines and the act, sir.

Dr. **Meyer**: The other thing is that the Environmental Protection Agency is required to review all of these impact statements, and we have set up a special organization within the Agency bringing together representatives of all the program offices both at the regional level and at the national level to take into account the very problem that you are raising. We are increasingly becoming the watchdog agency insofar as review of these impact statements is concerned.

Mrs. **Jones**: Can you suggest how we could get the impact statements done when the highway department refuses to do them?

Dr. **Meyer**: They have no option to refuse to do an impact statement. They can't get money from the Congress to build a road if they don't submit an impact statement if Federal money is involved. Now, if it's State money on a State-owned highway, the Federal Government has nothing to do with it. We still recognize States' rights. And if a State is building a road with State money within the limits of the State, then it's between the citizens and the State. But if there's Federal money involved, they have no alternative. The act of Congress is quite specific.

Mrs. **Jones**: They are not doing them.

Mr. **Haskell**: May I make just a few more remarks, please sir?

Dr. **Meyer**: Yes, sir.

Mr. **Haskell**: I realize this is not the forum for debate.

Dr. **Meyer**: Right. It is not.

Mr. **Haskell**: I don't intend to get into any debate with Mrs. Jones. The guidelines which we received from the Federal Highway Administration, interim guidelines, which required the preparation of draft environmental statements, specified—and I believe in accordance with the National Register—that any projects which had approached the design approval stage prior to February 1, 1971 did not require a draft environmental statement; however, that such projects in coordination or in consultation with the Federal Highway Administration Divison Engineer would be discussed and if to his satisfaction it was determined that environmental considerations had been given in the design of that project up to that stage, that the highway department would be allowed to proceed with that project without the necessity of starting from the beginning with the preparation of a draft environmental statement.

I believe this is the type of project to which you refer, which is the Morningside project as one of the projects which has reached that particular stage.

However, to further answer the question, on any new projects which are coming up which have not proceeded into the design stage, which are in the initial location stage— We had only had location approval on I-75 over Lake Allatoona. We had not had design approval by February 1. This project is now being reevaluated in toto from the beginning, and an environmental statement is being prepared.

In fact, an environmental statement was prepared over the line

F which was the controversial line, but due to the controversy which arose it was restudied.

We are in the State highway department and any highway departments which are Federally funded required and are preparing environmental statements, and distribution is being made not only to interested Federal agencies, including the Environmental Protection Agency, but to the State clearinghouse under Circular A-95 for their distribution to interested State agencies for review, to the regional clearinghouses which are the area planning and development commissions for their review, and to the regional metropolitan clearinghouses, of which Mr. Bennett represents the Atlanta region metropolitan clearinghouse, for their review and comment prior to—if possible within that two weeks— We give them 45 days to comment although the requirement is it must be in their hands at least two weeks before the public hearing.

Then we prepare a final environmental statement in which we must answer all comments received on the draft environmental statement and all remarks made at the public hearing pertaining to that particular project.

So we are in the Georgia State Highway Department fully complying with the law as it has been implemented and as the National Environmental Policy Act of 1969 requires.

Mr. Bennett: Mr. Chairman, could I say that for the last 15 years every major highway activity that the highway department has been involved in has been along the lines of an overall transportation plan which my agency has produced. This is a long and involved thing with representatives of the city and citizens and public hearings and so on.

Dr. Meyer: In order to keep this moving along—and I don't want to shut this off but this cannot become a public debate; it's a public hearing—could I ask you to just give me a few more minutes of what you want to say, ma'm, and then I must proceed here.

Mrs. Jones: Yes. I would just like to make one more statement. His comment about 1971 being the cutoff date was not written into the Environmental Policy Act. This is an arbitrary date decided upon by the highway department. According to the guidelines in the Federal Register with Mr. Russell Train's name upon it, any Federal project which has Federal funding must be gone back upon if it has significant environmental effect. It is not being done. We are still being refused in spite of the law.

Thank you.

Dr. Meyer: I will look into this further with the Federal Highway Administration.

Mrs. Jones: Thank you.

Dr. Meyer: Thank you for calling it to our attention. We are reviewing all of these agencies' statements.

Mr. Baron: It would be useful if Mr. Haskell has seen the report of the consultants if he could tell us very briefly what they consider some of the adverse noise effects, because this is something that is being explored at this time.

Dr. Meyer: Yes, I think that would be a useful thing to interject into the record, and then I want to proceed.

Mr. Haskell: The only thing I can say is I have seen the noise consultants' report and I have read the consultants' report. This particular environmental statement is being prepared by our design engineer, Mr. Hal Rives, in the Rural Design Department rather than the Environmental Planning Section, because this is the project which had advanced quite considerably.

I was quite impressed with this particular report, and I think it adequately covered the effect of noise which would be created in several of the corridors which were under consideration.

However, the report as you perhaps know had been reviewed by Dr. (Oden) at the University of Georgia who has run this thing through IBM machines, and so forth, and quantitatively weighed noise effects against other environmental effects of the location of the highway.

This is a very difficult area when you start speaking of quantitatively weighing one factor against another factor. It is subject I think for considerably more research at the Federal Highway Administration level as to what factors will be weighted in retrospect in respect to other factors. But these contributions to our environmental reports certainly are considered and are an important aspect of the environmental statement.

Dr. **Meyer**: I might add one thing here, and that is that our office has begun carefully reviewing these things. And we have been returning a fair number of environmental impact statements dealing with highway projects back to the Department of Transportation, asking for more specific information in this area, and not just on the overall water or air pollution aspects but specifically with respect to noise. So we are taking a very active role in this area of concern to ensure that the State agencies are indeed getting the proper information and also that the public imput is included.

I recognize some of the problems of interpretation, and we are busily reviewing with each of the Federal agencies their rules and regulations and their methods of implementing them not only with regard to the impact statement but with regard to all other aspects of noise control.

I had one series of meetings with all the Federal officials concerned with noise, and we are now engaged in obtaining from them all of their instructions so that we may review them and, in conjunction with the Council on Environmental Quality, make the necessary recommendations for change.

It's a little late, but I would like to see if Mr. John Glenn is here.

Mrs. **Northrup**: I wonder if you would be so kind as to allow me to testify now since I have come to make a statement on behalf of a group that is connected with this highway fight. I think it would be most fitting.

Dr. **Meyer**: What is your name, ma'm?

Mrs. **Northrup**: Mrs. Northrup.

Dr. **Meyer**: From the Morningside Civic Association?

Mrs. **Northrup**: Yes.

Dr. **Meyer**: Mr. Glenn, are you here?

Mr. **Glenn**: Yes.

Dr. **Meyer**: Would you yield to this lady your time? You were on the schedule for this particular time, but it's up to you.

Mr. **Glenn**: I yield gracefully.

Dr. **Meyer**: Thank you, sir.

Mrs. Northrup from the Morningside Civic Association representing a group of citizens I gather from Morningside. Welcome.

STATEMENT OF MRS. ADELE G. NORTHRUP, MORNINGSIDE-LENOX PARK COMMUNITY, ATLANTA, GEORGIA

Mrs. Northrup: My name is Adele G. Northrup. I represent the Morningside-Lenox Park community which is currently contesting in Federal court the construction of I-485 through our neighborhood and through several other inner-city neighborhoods. We are concerned about the highway's adverse environmental impact, part of which would be an increase in the noise to which we are already subjected.

The homes in Morningside are closely spaced so that home noises from appliances and power tools can easily invade neighboring structures.

Outside the home we listen to airplanes, electric hedge clippers, and power mowers rather than birds, and to motorcycles and minibikes rather than rustling leaves. Our grand old trees which serve as a buffer to noise also serve to attract noise, in that people in cars and on motorcycles drive through to see the greenery. Our streets are also heavy with commuter traffic noise. We oppose the widening of streets proposed for our area. Our streets are already too noisy.

It is difficult to return to a noisy home and a noisy neighborhood after exposure to mindless background music in the office or to "shopper alerts" over the loudspeaker in discount houses. The only way to block out noise is to air condition the home, but the steady hum of the air conditioner's motor is merely an added noise burden.

Now Morningside is asked to shoulder an additional noise burden from the proposed interstate. During the 4-year period of construction we will be subjected to traffic rerouting, heavy duty trucks, blasting, demolition, and construction. Once the highway is completed, we will be continually subjected to eight lanes worth of roaring trucks, cars, and motorcycles. During the rush hour traffic jams the stopping, starting, idling, horn blowing, and revving of motors will be intolerable.

The additional air pollution from the expressway will undoubtedly kill many of our dogwoods, the tree most susceptible to air pollution. The loss of trees will be the loss of the noise buffer between us and the traffic.

The June 21, 1971 edition of the *Atlanta Constitution* carried an editorial pleading for a reduction of noise levels on our streets. A June 29th article in the *Constitution* pleads for reduced noise levels in the home.

We plead for a halt to the construction of I-485. Construction noise will shatter our windows, crack our plaster, masonry, tiles, foundations, and art objects. Once completed, the eight lanes of noise coupled with our present city noise levels will reduce our property values, impede work efficiency and hearing, produce harmful cardiovascular, glandular and respiratory effects and harm our unborn children.

In summary, widened streets and I-485 noise will create general urban social unrest. We urge efficient and quiet public transportation as an alternative to I-485 and street-widenings.

Thank you.

Dr. Meyer: Thank you very much, Mrs. Northrup.

Panel, any questions or comments?

Dr. **Lyons**: If the alternate transportation systems are not quiet or not as quiet as we would like them to be so that people are still disturbed—say people in your community are still disturbed even after considering any available technology for noise control—how would you propose compensating you for the number of bad things that you have cited might be produced by these high noise levels?

Mrs. **Northrup**: I would like to say presently GM is being sued. I believe they have a monopoly on the making of buses. And the people who are suing them feel that perhaps they are not turning out a better bus because better buses may mean people will not be buying so many cars and using them.

Even if buses were not as quiet as we would like, we still feel that mass transportation offers the only real solution to moving masses of people within the city. We feel the car simply is not a solution, and the building of highways will merely result in the production of more cars. But buses really can take the place perhaps of between 30 and 40 cars on the street. So we would support mass transit even if it weren't ideal. We feel that the car is really just no solution for moving people within the city.

Dr. **Meyer**: Let me ask a couple of questions in that regard if I might. First, you make the point that mass public transportation is an alternative, and, of course, this involves some sort of construction. And, of course this hearing has been dealing with the problems of construction. We have been hearing from a wide variety of construction manufacturers about the difficulty of producing absolutely quiet and silent construction equipment.

So I guess the question I have to ask is: in the alternatives are you taking into account that even some part of the city is going to be subjected to noise during the construction?

Hopefully we in our efforts to get quieter construction will be able to impose standards, but are you willing to accept that as a reality that cannot be escaped?

Mrs. **Northrup**: Yes. I think that construction noise in the city is a reality as long as high-rise buildings are being built, homes are being built. There will always be some construction noise. And I think that construction noise for mass transportation facilities would be acceptable.

The thing is that we feel with cars that the more roads that are built the more cars will be produced and so the cycle just goes on and on. First they will be building 485, it will become clogged, and then they will be needing to build another highway and another.

But perhaps mass transit can be sort of a not one-time but certainly the construction won't have to be repeated as often.

And we also feel that buses can run on existing streets whereas cars would require street widenings.

Dr. **Meyer**: Could I carry that line of questioning just a bit further? If we had the authority, which we may get from the Congress, to get transportation standards in relation to noise and you were assured that the vehicles that were produced and operating were quiet, would you still have this antagonism towards the automobile regardless of the noise?

Mrs. **Northrup**: Yes, because the car represents an unrealistic demand on our natural resources, the amount of water, steel, rubber, plastics. We simply cannot go on consuming our natural resources producing a private transportation system for each person who desires mobility.

Certainly mass transit would be a much wider use of our natural resources. And also even if the noise pollution is solved, the congestion problem will not be solved. The air pollution problem will not be solved. The visual blight problem will not be solved.

So we oppose the highway and the car on many environmental points, but today we were speaking mainly to noise.

Dr. **Meyer**: Thank you very much.

Any other questions from the panel?

(No response)

Thank you.

Mrs. **Northrup**: I would like to know if the panel would be interested in hearing a tape of traffic on our street that was taken, interestingly enough, at one in the morning. I think sometimes we talk a lot about things, but it might be interesting to hear this.

Dr. **Meyer**: Panel?

(General assent.)

Do you have it with you?

Mrs. **Northrup**: Yes.

Dr. **Meyer**: How long does it take?

Mrs. **Northrup**: You could probably get an idea in just a minute or so.

Mrs. **Virginia Gaddis**: (Morningside-Lenox Park Community): The traffic is not steady, but sometimes that is even more aggravating. This is one o'clock in the morning. It's not steady. It's steady most of the time.

Mr. **Baron**: While that is being set up, may I ask a question? I'm interested in your tolerance of construction noise. After describing some of the effects of intense noise, and so on, you say you wouldn't mind construction noise if the end product were such and such. You don't feel in a sense that something should be done about reducing the noise of construction? You accept it as a norm?

Mrs. **Northrup**: I would like to see all noise levels in the city reduced. It's just that I feel that building a mass transit system is something that will not have to be repeated every few years, whereas if we depend on cars, street widenings will be constantly taking place. Highways will constantly be needed. More highways will be needed.

Mr. **Baron**: I'm trying to clarify that you accept construction noise as a norm, as something that accompanies construction, intense construction noise? You believe that's the way it has to be?

Mrs. **Northrup**: No, it's just that I didn't come here this morning prepared to make a statement about it. I would like to see many noise sources reduced, including construction. I mentioned the minibikes, the motorcycles, the hedge clippers, kitchen disposals, the vacuum. I'm sure many things are made noisier than they really have to be. And I think maybe some construction equipment could be made to be more quiet.

Mr. **Baron**: The answer is yes. Thank you.

Dr. **Meyer**: May we now have your tape for a few minutes, please.

Mrs. **Gaddis**: This is one block, and I'm not sure the part here will be the best part, but we'll try it. This is one block from the proposed highway I-485. This was taken from the window of a bedroom.

(Tape)

Dr. Meyer: Might I make an observation here that would be appropriate in the record before asking Mr. Glenn, who very patiently yielded his time here, to come forward. We have available to us measurements being made on certain interstate highways, and I think it's rather interesting to point out that at a distance of about 300 feet from a major four-lone highway near Washington, D.C., that the overall sound pressure levels measured on the "A" scale are, about 40 percent of the time, day or night, on the order of between 70 and 75 dB(A). They fall down to around 50 or 60 dB(A) most of the rest of the time. But it's rather interesting to observe that on a really busy true interstate—I'm not talking about an interchange or an area that is servicing an hourly traffic flow or commuter traffic—that this level seems to stay pretty constant no matter what the hour of the day is as far as these effects, whether midnight or 1 o'clock or 10 o'clock in the morning. We will be discussing some of these problems at our hearing on transportation in Chicago, because one of the principal sources of noise that is heard as you get further away from highways is tire noise, particularly truck tire noise. And each sound has a characteristic significance. By frequency analysis you can tell pretty well where it's coming from.

Mrs. Northrup: Thank you.

Dr. Meyers Mr. Glenn.

STATEMENT OF JOHN GLENN, CITIZENS FOR CLEAN AIR

Mr. Glenn: I have a written statement here which I will hand in and which I think exceeds your stated limit of 100 words by about 10. I will be glad to take a few of the "a's" "the 's" out if that will help get it in the record. And I will try to be equally brief in what I have to say.

I really have only two main points to make. One is that in our activities on behalf of clean air the first reaction we got from many people is, "Well, thank God there is a citizens' group that is trying to do something about the air."

And a great many of these people added as a second thought, "While you're at it, can't you do something about noise pollution?"

There is public interest. There is probably more hopelessness here because we have been even slower in our efforts to do something about noise pollution than we have about water and air pollution.

The second thought I want to leave you with is this: We had some experience in our involvement in setting ambient air standards that I think may have some relevance to what your agency will be trying to do. The salient fact to me at least that emerged from all this was this: If you wait until there is indisputable proof of the medical effects, primarily the medical effects of a given level of pollution, you will have waited too long. I think the same thing is going to be true about noise pollution.

Let me tell you a little bit about why I think, in spite of a great deal of money and time having been spent on air pollution, very little effective control has been achieved in this country. And there are certain reasons that relate to this point I just made.

I happen to be an actuary. With a statistical background, I took the assignment of reading a number of the studies that had been made on air pollution. I plowed through one done in Nashville covering gathered statistics for 10 years. They must have spent a million hours on it. There was another one in Buffalo, and a couple of British studies that were equally thorough.

And I found that the research people doing these studies were extremely conservative when it comes to saying A causes B. The reason they are this conservative is their whole training as research scientists makes them conservative in this respect.

Now, there is a gap somewhere between the research and the policy-making level. I'm aware, of course, I may be speaking to the wrong group. Maybe I ought to be talking to a Congressional committee. Your office has its mandate, and I gather there is a lot of emphasis to be placed on research initially. I wish it were otherwise.

What seems to me to be needed are some people at a policy-making level who have a scientific background but who can take the scientific evidence and act when there is a reasonable degree of certainty that there are harmful effects being produced by something even though proof is not conclusive and probably never will be conclusive in the sense that would satisfy a research scientist.

I talked to one of the doctors in Nashville who had done the study, worked on the study there. Her first reaction was, "Well, we need more studies." Well, we do. But we need to act on the information we have already got.

I would assume that the information about effects that is available to us is as great as that that has been available to various European countries that acted. And if they have set standards for apartment noise with the available evidence, why can't we do the same thing? And why can't we spend the money in sending somebody to London and finding out not just technically but politically how they have been able to make London a far quieter city than New York is, rather than waiting for evidence that so many decibels is going to leave somebody with a permanent degree of deafness?

I think you're going to run into the same problems here that there are many other cases of deafness. And when you get beyond the level of hearing impairment into some of the other psychological effects, you'd be in a much thornier area there as far as any kind of scientific proof is concerned.

It's the feeling of our organization that we are all entitled to a decent environment and that the mission of the Noise Office ought to be to eliminate objectionable noises and that we should not as citizens be required to prove that a given noise level is going to of necessity produce a certain degree of hearing impairment or that it's going to make us less effective in our work or anything else. It is simply objectionable.

And your mission ought to be to go to work, produce a quieter environment, quieter cities. Fine, go ahead and collect the scientific proof at the same time. But I think the whole thing is on the wrong track if you're going to wait until this proof has been assembled to the satisfaction of almost everybody involved.

Dr. MEYER: I appreciate your comments and I want to disabuse you of any notion that the Environmental Protection Agency is going to study this problem to death. The points you are making are ones I completely and wholeheartedly agree with. As I mentioned earlier, we are responsible for preparing a rather comprehensive report to the Congress, which we look at as not just being another documentation of needs for research, although that is one of the things that will come out of it. What we are doing right now, with a target date of submitting it not later than the first of January, as is required by the law, is a comprehensive overview of what is known and what isn't known. In that report will also be an assessment of what is known about physiology and psychological effects, far more important and germane to what you have said. It will include a review of all of the literature and all of the laws in 20 foreign countries, which is being undertaken right now, including those which are in the Communist area as well as in the so-called Western bloc countries.

We are studying, through George Washington University, all of the existing State and municipal laws in the United States, with a view towards doing just exactly what you said—discovering what has been done, what's good, and what's bad, to set a framework for action, assuming the Congress gives us the authority to set some standards. That law, which is now in Congress, also charges us with the responsibility of assisting the State and communities in developing model laws to cover those areas that will not be preempted by the Federal regulation.

We have an optimistic timetable. If Congress passes the law now being considered, we would anticipate that the first of these standards will be available for public consideration in about 18 months. And that may sound like a long time, but the reason it takes that long is that, again, after having had hearings such as the other ones we are going to have, we have got to come up with the recommendation of the rules and regulations and then return to the public so the public can comment thereon. We estimate that within 18 months we will indeed have done this. So I hope I am giving you a picture that this is an action-oriented agency, not a study agency.

Mr. GLENN: I only hope it turns out to be that way.

Dr. MEYER: Any comments, or question panel?

Mr. BARON: Well, just to play devil's advocate in a sense, how would you define objectionable noise?

Mr. GLEEN: Well, I'm aware that there is a problem here I suppose basically in one of two ways. It's a steady noise in the absence of which I can't hear normal conversation. In other words, if I have been exposed to it for several years and move out of I can't hear what people are saying in normal conversation, I'd find that objectionable.

Mr. BARON: Temporary deafening?

Mr. GLENN: Yes. And, second, anything sudden and startling. Motors backfiring. I have a feeling that a reasonable national consensus could be found without extensive investigation and argument of the question.

Mr. BARON: I happen to agree with you. I have been working on the noise problem for 7 years from the citizen's point of view. But it is necessary to try to give some structuring of the concepts so that it makes it easier for EPA, for example, to give directives and work out directives to industry to meet these things.

One of the things that we as citizens have to do is concretize some of our reactions, what we would like to see as far as a good noise environment is concerned.

It's a "toughie" but it's part of our homework.

Mr. Glenn: Yes, I recognize this. But I think there's another approach, and that is simply let's make more use of the existing technology.

Mr. Baron: We agree 100 percent.

Mr. Meyer: Thank you very much, sir. Before recessing to reconvene at 1:30, someone asked from the floor if a member of the panel would give a brief explanation of what dB(A) means. I hope that person will be back after lunch. But since that person might have other plans, I will ask my eminent colleague Dr. Bender to give a brief description or definition of this terminology.

Dr. Bender: Well, so-called "A" weighting which gives us a number which we call dB(A) simply reflects the fact that people don't hear as well at low frequencies as they do at high. If you have two tones that have the same pressure level, one will generally not be able to hear the low frequency sound— The low frequency sound won't sound as noisy or loud as the high frequency sound.

So if we have a complicated sound that is emitted from a piece of equipment, there is a meter, an electronic weighting network that tends to decrease the effect of the low frequency sound in generating a reading on this meter. So that is what dB(A) does. And subjectively every time a level goes up 10 decibels, 10 dB(A), it sounds twice as loud. And, of course, the same is true in the other direction.

So if an 80 dB(A) level sounds twice as loud as a 70 dB(A) level, 90 dB(A) level sounds twice as loud as an 80 dB(A) level and four times as loud as a 70 dB(A) level. That's sort of a guide that you can use to try to get a handle on what these numbers means.

Dr. Meyer: Let me give you a couple of other measurements that you might find useful. At a noise condition approximating 50 dB(A), you hear the normal spoken voice at something over 12 feet —conversational tone. At a level of 60 dB(A), however, the normal spoken voice can only be heard up to about 4 feet way. And at 70 dB(A) it's about 1 foot. These phenomena have been determined by many scientific experiments. This gives you some sort of a point on the curves. As you get up to the area of hearing loss, between 85 and 90 dB(A), you cannot really hear the normal voice. You can almost use your ears as a sound level meter. With a person standing right next to you—as we have used in the military regarding people working around jet engines, and so on—if you can't hear the man talking to you in a normal vice while he's standing shoulder to shoulder, you're in an 8-hour noise hazardous area and ought to put ear plugs on or get out of the area. It's a very simple rule but a very effective one. On that note we shall recess this hearing until 1:30.

(Whereupon, at 12:35 p.m., the luncheon recess was taken.)

AFTERNOON SESSION

1:50 p.m.

Dr. Meyer: I will call the closing session of this public hearing to order. Is Mr. Pierce Mahoney present?

(No response)

I would now like to ask if Mr. John Wright of the Atlanta Labor Council has arrived. He is due here around two.

(No response)

Very well. I will proceed then and invite Mr. Peter Chanin if he is present to come forward. Glad to have you with us, Mr. Chanin.

STATEMENT OF PETER CHANIN AND GEORGE LIPTON, LCL CORPORATION, ATLANTA, GEORGIA

Mr. **Chanin**: Dr. Meyer, distinguished members of the panel, ladies and gentlemen, I am Peter Chanin, and this is my associate, George Lipton. We are with LCL Corporation, a Georgia Corporation here in Atlanta, Georgia.

LCL Corporation was formed in March of 1971, and its sole purpose is marketing an item that I would like to speak to the panel about today. This is the Weka Oxylance.

Mr. Lipton and I have attended some of the meetings of this panel for the last two days and have been interested in the fact there has been very little mention in the wrecking of concrete about one particular procedure, and this is thermic demolition. We have heard a good bit mentioned about breaking of concrete with the normal methods of demolition such as jackhammers and hydraulic means.

Thermic demolition of concrete can be achieved by use of a thermic lance, and this is the Weka Oxylance. I believe you gentlemen have this material that has been handed out to you by Mr. Lipton. This material is not the text of what I am going to speak about but is a little bit greater material. I would like to read just certain parts of this text to you, and I think this will explain the oxylance.

Dr. **Meyer**: Very good. Go ahead, sir.

Mr. **Chanin**: If you will turn now to the second page, the first paragraph, the Weka Oxylance is a 14-foot thermic self-consuming lance that offers a totally new method for dismantling or modifying structures quickly and quietly. Designed for on-the-job flexibility, the Weka Oxylance adapts to particular construction needs.

If you skip to the bottom paragraph, it eliminates noise, dust, and vibration so crews can work in restricted areas or near sensitive equipment. Whole structures can be dismantled without rubble or costly cleanup. Also small sections can be removed or clean hole perforated without stress to adjoining walls and floors.

If you will now turn to the fourth page, wrecking jobs the quiet way, an old demand by all enemies of noise has become reality. Yard-thick, heavily reinforced concrete walls can now be broken down by an oxygen-core lance without causing practically any noise.

This development initiates a new trend in demolition. Its importance is related to the fact that wrecking jobs have to be carried out mostly in densely populated regions in order to make place for new construction.

If you will now turn to page 5, first paragraph, the speed with which the Weka Oxylance cuts and burns concrete is but one of its advantages. In most cases the absence of noise and vibration constitutes by itself a determining advantage over other methods. The lance is not only used in demolition but can be implemented to add conduits, passages, and air conditioning shafts to already finished concrete and steel buildings.

I think this very brief reading is in itself a significant story of a new way of quietly achieving the breaking of concrete. The Weka Oxylance by no means can be used in all applications where concrete has to be gone through. There are certain areas such as asphalt where the oxylance has difficulty because the burning of asphalt creates dense smoke. When burning concrete, reinforced concrete or concrete in conjunction with any of the exotic metals, there is very little smoke created, and that which is created is non-toxic and easily removed by any type of ventilation.

We do not want to take up a tremendous amount of your time today. We did want to present the oxylance.

I would like to summarize very quickly by just giving to the panel some of the features of the oxylance that we feel are most important to realize.

One of these is cost. There is no set means of determining whether using the oxylance is more expensive, less expensive, or approximately equal to the conventional means of demolition. In some applications it is cheaper. The speed with which it can be used to achieve the necessary demolition would make up for the possible additional cost in material, the cost of setup with oxylance.

We heard yesterday several of the manufacturers of the air hammers and other concrete-breaking material say that quieter machinery will cost in the neighborhood of 10 or 20 percent more than the conventional machinery that is now on the market. This 10 or 20 percent more is if the people needed to replace what they had. The actual cost for these construction-demolition companies is complete retooling, and this retooling is 10 or 20 percent greater than it would have been if they were buying just replacements.

With the Weka oxylance the cost to set up and be able to use this when it is necessary not to make noise is less than $200. This is what would be necessary to have the necessary attachments, hoses, burning apparatus and protective clothing for the individual who would be using the lance.

The lance itself is a consumable item so whatever is expended for the lance would be part of the actual cost of the operation. All that is needed to run the lance is oxygen. There is no compressor involved with the operation whatsoever. Therefore, there is no noise.

Well, I say there is no noise. There is about the same noise that would be if you used an oxyacetylene torch.

I mentioned the speed of the lance. One of the items that was discussed was the fact that demolition sometimes went on and on and and the noise might be tolerated if it was just for a few days or maybe a week. The oxylance does speed up demolition where it is applicable.

I hope that this information will give the panel some further enlightenment into the area of posible means of wrecking. I hope that this does provide ample information on the lance, and if not we will be glad to answer any questions I am sure you might have.

We thank you very much for this opportunity to speak.

Dr. MEYER: Thank you very much.

Panel, questions?

Dr. LYONS: How long have you been selling this unit?

Mr. **Chanin**: We have been selling it now in the United States since March.

Dr. **Lyons**: And what has been the reception?

Mr. **Chanin**: We have found that the people we have spoken to have been extremely interested in this prospect of demolition but rather leery of being the one to take the chance of using it.

A lot of these wrecking companies have a bid that they have to put in, and they are not really trusting our estimates of what it's going to cost them doing it our way. They might have a timetable to be on and they are not sure that maybe our way will do it, so if they fail by our means then they will have to go back to conventional means and they will miss their timetable.

So it's a question of getting them where they have little fear of trying this particular method.

Dr. **Lyons**: Do you believe the only retardant then to widespread acceptance of this technique is just that people tend to be afraid of new things, that as soon as this is no longer a new thing that this will be widely accepted? Or do you believe that there are other factors that will prevent widespread acceptance of this tool?

Mr. **Chanin**: There are naturally other factors. I think the greatest factor is, you know, a new product. The other factors are that the people are not sure whether they can use the lance, although it is very easy to be used.

Dr. **Lyons**: $200 is not a significant amount of money for a construction company to invest to try out a new tool that they might eventually purchase a number of at some later date.

Mr. **Chanin**: That is true.

Dr. **Lyons**: A pipe wrench costs $60.

Mr. **Chanin**: This is what we have been telling them.

Dr. **Lyons**: So the tooling investment for a trial unit apparently is not prohibitive. Why—

Mr. **Chanin**: Most of them are willing to try it or let us give them a demonstration of it, but to actually use it on a job where they do the whole job by this particular method they are leery because they have not had enough experience with it to determine what their cost for the whole job will be.

In fact, we have not had enough experience with it to tell them exactly what their costs are. We can only give them estimates.

Dr. **Lyons**: The point I'm trying to get at is: What is your estimation of the value construction or destruction companies place on quietness? Any value? Or are you selling on strictly an economics basis?

Mr. **Lipton**: Let me answer your question. Our product has been accepted by the foundry people. In other words, the people that are in cast iron foundries that have steel mills use our product to untap their furnances. In other words, they get a freezeup in a tap hole or something of that nature and they use the oxylance extensively for this purpose. So it has been accepted in some industry

Now, back to your question regarding do we think that the demolition and construction people will accept our product, it's a yes or no type answer. I can't give you a firm answer because the response we have had over the United States—and we have done some mailing to demolition and construction people—has been adverse in some areas and good in others.

Here in Atlanta we have done some work for two or three of the large demolition companies in town, and the value they place on noise is little or non-existent. They don't care very much.

I can make a quote to you from one fellow we talked to on a job that involved cutting through 16 inches of reinforced concrete in a courthouse annex in metropolitan Atlanta. And he told me he just didn't care how much noise it made. And there were people working upstairs during this demolition. Cutting through 16 inches of reinforced concrete to make a door opening with a jackhammer will create an excessive amount of noise. I don't know how many decibels it would register but I'm sure it would be up around the 100 mark even to somebody who was working on the second floor of the same building.

So I don't think at present that the demolition companies place a high amount of their time and cost into thinking about how much noise they are going to make, because whenever possible they love to use dynamite for demolition because it's the cheapest way.

Dr. LYONS: Thank you.

Dr. MEYER: That was very well said. What you're saying is that right now your main market attractiveness is the fact that you have a speed of operation and perhaps a clean operation that can be used some place—

Mr. LIPTON: Yes.

Dr. MEYER: —where you can't blow it down and you have got to have a nice, neat cut.

Mr. LIPTON: That's right.

Dr. MEYER: Just for the record though—you mentioned it somewhat—are there any specific problems associated with this device of work or exposure to some hazard other than the heat from the lance itself?

Mr. LIPTON: No, sir. The heat that is produced by the oxylance will approach 10,000 degrees Fahrenheit when you're cutting through concrete. That is the only thing that has been measured so far. So there is protective clothing that has to be worn.

This product has been used extensively in Europe. You can see by the pictures on our brochure they were all taken in Zurich, Switzerland.

Mr. CHANIN: There is a brochure in the back of each of the documents.

Mr. LIPTON: So the heat is the only precaution that needs to be reckoned with. Anybody that is adept at using an acetylene torch can use our product with no problem whatsoever.

Dr. OKUN: What is the cost per 8-hour day of operation for one man, one lance?

Mr. LIPTON: Well, the lance consumes itself in roughly 5 minutes, so you can say, well, a guy can consume say 10 or 12 lances an hour depending on how fast he works. And a lot of times, you know, with the labor problems here in the United States, construction workers seem to sort of lag behind in certain areas.

So I would say that in an average 8-hour day roughly 80 lances would be consumed at a cost of anywhere from $5.90 per lance to $8.50 per lance depending on the quantity ordered. So at a maximum of 80 per day you are talking roughly about $700, something like that, just in material cost, and then your oxygen cost and then your labor cost on top of that. So it would approach $800 or $900, maybe even $1,000 depending on how many men you had working and how fast they could work.

Dr. **Meyer**: Well, to get an order of magnitude for the expenditure of say that $800, say he was cutting through a 10-inch builtup brick wall.

Mr. **Lipton**: You mean reinforced concrete?

Dr. **Meyer**: Reinforced concrete with a brick facing.

Mr. **Lipton**: Let me just give you an example. A 4-inch-diameter hole through 6 inches of reinforced concrete would take roughly 5 feet of lance. The lance is 14 feet long. It would take approximately 1 minute in time.

Now, if anybody is familiar with core drilling or diamond drilling, they will know that core drilling would cost you to make a hole of that nature, if you were in the air conditioning business and contracted out to a core driller or diamond driller, about $30 for that hole, whereas using our product it would cost you less than $8, including labor, cost of goods, and everything involved, setup.

Dr. **Meyer**: That is the sort of—

Mr. **Lipton**: Right. That will give you somewhat of an example. Most of the figures we have are European figures, and they are being converted right now into American language or technology.

Dr. **Meyer**: We thank you very much for giving us this information, and it may be that we will want to get together with you and have you give a demonstration of this.

Mr. **Lipton**: We would certainly be glad to. The only noise involved in the operation of our product is the slight hissing noise of the oxygen flowing through the lance itself. Because the lance looks like just a metal pipe that is 14 feet in length and 3 inches in diameter.

Dr. **Meyer**: There is a tremendous amount of demolition associated with some construction operations in urban builtup areas, and I'd like to get in touch with you and see about arranging for a possible demonstration.

Mr. **Lipton**: We would be glad to. We have had some demonstrations in New York for Wrecking Corporation of America, in Newark at the River Terminal Shipyard, but even with Wrecking Corporation we couldn't do any good with those people because of the fact they just didn't seem to care about how much noise they were making.

Dr. **Meyer**: Since we're interested in noise and also interested in some other things—the Agency is interested in control of air pollution—I can easily see that this is a much less dusty type of operation. So I'd like to talk to you all subsequently. We interceptors on the west side.

Mr. **Lipton**: Thank you.

Dr. **Meyer**: Before asking if Mr. John Wright would come forward if he is here, a representative of the FAA who was speaking about some of the problems at Atlanta airport has asked me if he could make a brief report of some subsequent conversations he has had. If you will hold that rather quickly, sir, I will entertain for the record your presenting the information you want to.

FURTHER STATEMENT OF JAMES RICKARD, AIR TRAFFIC DIVISION, SOUTHERN REGION, FEDERAL AVIATION ADMINISTRATION

Mr. **Rickard**: Thank you, Dr. Meyer.

What I have to say briefly concerns the testimony given by Mr. Benson this morning in which he so very well presented his problem to the panel and to the audience relative to aircraft noise over his home.

Mr. Allgood here, who is the operations officer for the Atlanta airport traffic control tower, and I talked at length with Mr. Benson privately after his testimony, and although we didn't by any stretch of the imagination resolve his problem, we did point out to him that certain procedures have been adopted, air traffic control procedures have been adopted, at the Atlanta airport, and others have been revised, which have provided a measure of relief in a general sense to the overall aircraft noise problem in the vicinity of the airport.

I think we succeeded in convincing him that we in that sense, in a procedural sense, have done all that we can possibly do with respect to the noise problem in a general sense around the airport. And I, of course, would want to reiterate that we didn't resolve his problem, and I don't think we can.

Dr. **Meyer**: Thank you very much sir. Mr. Baron has one question.

Mr. **Baron**: I don't want to take up time so don't address yourself to this if you can't. But as FAA noise abatement officer, could you just very briefly state your primary responsibility or duty or function?

Mr. **Rickard**: Well, as I mentioned earlier, that is more of a title than anything else, because the noise problems in the region, in our Southern region, are dealt with primarily at the facility level.

For example, if we get a complaint concerning noise, we refer this to the air traffic control facility at the airport where the noise complaint comes from, and in that way the complainant talks directly to the people who can explain to him in a very real sense—They can invite him out to visit the facility, and they can show him firsthand what is being done and the problems that the facility has in controlling traffic while at the same time doing it safely and with as little noise as possible.

So my position has been more or less the position of giving staff guidance and being the regional director's representative at such meetings as this and attending other meetings with our counterparts in the Washington office, but the real meat of the problem is handled at the facility level.

Mr. **Baron**: But you serve as a source of input to upper echelons in terms of the complaints, and so on?

Mr. **Rickard**: Yes. That's correct. We are the focal point. My office is the focal point in the region for these problems.

Mr. **Baron**: I don't envy you.

Dr. **Meyer**: One more question before we proceed.

Dr. **Lyons**: When were these procedures instigated that you consider are the ultimate that can be taken at this time with our technology? In past months or in past weeks or years?

Mr. **Rickard**: Well, the procedures that we discussed with Mr.

Benson primarily were adopted in recent months as a result of a national policy which deals with both noise and safety in the handling of high-performance aircraft, principally turbojet-powered aircraft. We call this "keep them high" procedures that we have adopted at most of the airports throughout the entire country.

That simply is this: In case of jet aircraft, of course, you are aware that they cruise at a very high altitude and we keep these aircraft as high as we possibly can as close in to the airport as we possibly can, while at the same time realizing that some time, somewhere, the aircraft have to descend if they are going to land.

So we keep the traffic patterns as high as possible to keep them above the people that live on the ground in an effort to decrease the noise, plus the fact that we keep them above the areas where the lighter, smaller aircraft operate and reduce the potential of a mid-air collision.

Dr. Lyons: This seems like a fairly simple administrative procedure to decide upon. It may be difficult to implement but not too difficult to conceive that this would be an approach to reducing noise.

Did Mr. Benson's 9 years of persistent complaining influence decision at the Atlanta airport at all? Or was this made by a national policy decision by people who didn't even know he lived near the airport?

Mr. Rickard: Not altogether. We have adjusted, down through the years, our traffic patterns upward, so to speak, because of noise complaints.

Dr. Lyons: I'm wondering about the channels for relief for people like Mr. Benson. Did he influence this decision? That helps him I mean—

Mr. Rickard: Well, I can't say that.

Dr. Lyons: Only indirectly?

Mr. Rickard: Only indirectly.

Dr. Lyons: A number of people—

Mr. Rickard: As well as our concern for all of our airport neighbors. And, of course, Mr. Benson has brought his problems to us frequently, and, of course, we are vitally interested in his problem. But let me point out—

Dr. Lyons: But his problems were not going dircetly to the people who made that decision?

Rickard: No.

Dr. Lyons: His problems were going to an air traffic controller who was following procedures established in another office? Is that right?

Mr. Rickard: Yes. That's correct. These procedures that we have adopted, as I said, are twofold, for both purposes of a safer operation for high-performance aircraft and for noise. I would suppose that the primary consideration was for a safer operation because of the number of mid-air collisions that you I'm sure are well aware of that we have had in the country in recent years. And we have pooled our collective thoughts in an effort to come up with the safest type of operations we could have.

But the noise relief has also been very evident in these procedures, and, of course, we are happy about that.

But as far as Mr. Benson's problem is concerned, he lives one mile from the end of the runway, and these aircraft, although we could keep them at 35,000 feet until they got on top of the airport, have still got to come down and pass over his house on the final approach for a landing, and this is where we reach the point where procedurally we have done about all we can do.

Dr. LYONS: Thank you.

Dr. MEYER: Thank you very much.

Is Mr. Wright here?

(No response)

If not, is Mr. Louis Abernathy here?

STATEMENT OF L. E. ABERNATHY, ATLANTA AREA ASSOCIATION OF SENIOR CITIZENS CLUBS

Mr. ABERNATHY: I am a past president for a couple of terms of the Atlanta Area Association of Senior Citizens Clubs, and I was asked by the Senior Citizens Services of Atlanta to come down here and represent the senior citizens.

Now, I don't have any particular complaint about noise myself. I live sort of out in the suburbs. And some of this gentleman's planes fly over my house when they can't find a place to land, around and around and around. But I have become accustomed to that, and it doesn't bother me too much.

But I did not come here with any special thing to say or any special complaint about noise. I came here mostly to learn what was going on and make a report back to the meeting of the Association of Senior Citizens Clubs as to what was going on.

In other words, the only noise that bothers me a great deal is some of these older women when they get started talking. And I'm sure they feel the same way about me. So that's more or less a stand-off. (Laughter)

So I really don't have a great deal to say other than that, unless you gentlemen would like to ask some questions. And I am familiar with the street noises, of course. Our buses don't make as much noise as the old trolleys that we used to have. And having been a supervisor of a communications company for 47 years—that is, was with them 47 years, supervisor the last 16— I'm familiar with the noise we make when we dig up the street in order to repair our underground cables. But usually we farmed that out to contractors and we let people fuss at them.

You're familiar with the air hammers I'm sure. Outside of that I don't think that the profession that I was in created much noise as far as the public was concerned. Our automatic equipment, of course, is a little noisy, but that was only to our own employees. And now we have gone into transistorized equipment and electronics which is far less noisy than our old printers and much faster too.

So if any of you gentlemen would like to ask me any questions, I can elaborate on most any subject. The less I know about it, the longer I can talk about it. (Laughter)

Dr. MEYER: Well, Mr. Abernathy, thank you very much, sir. And I would appreciate it if you would communicate back to the groups that you are representing that we are interested in the problems of noise and control, and if they have any specific complaints in this regard, or views, we will be happy to receive them by mail. Panel, do you have anything to add?

Mr. BARON: Just two questions. As past president, did you have any unusual type or special type of noise complaints from your constituency?

Mr. ABERNATHY: No, I have not heard a great many complaints from senior citizens regarding noise. They might not have thought about it. A good many of us don't hear as well as we once did anyway, so maybe noise doesn't bother us as much.

I mean I personally, while I don't consider myself as being deaf, do not hear quite as well as I did when I was 25 or something like that. When people start turning their head and talking to me or start talking walking away from me, I don't always understand what they say, particularly if they don't speak my particular accent, which believe it or not, whether you think so or not, is Southern. I was produced in southern Alabama. I'm a product of Appalachia.

Mr. BARON: You said something about an industrial use where you cut down noise by changing to electronics or transistorized equipment. I'm very interested. You changed the noise source and got rid of it? Is that correct? In some industrial activity?

Mr. ABERNATHY: Well, actually, the change was made primarily to increase the speed of communications because the computerized equipment and everything operates much faster than the old teleprinters. And the old teleprinters operated like typewriters. They used to bang, bang, bang the platens of the type bars hitting the platens.

That now has been mostly eliminated by a little type wheel about like your thumb that has about six characters on it and just turns around, and the printing noise is very slight. But, as I say, that did not affect the public.

You take a relay office, an old-fashioned relay office like we used to have with, say, 400 or 500 teletypewriters. That's the Southern Bell name for them. I was with Western Union. We called them teleprinters. But they're all made by the same companies so most people know them as teletypewriters possibly. And you take several hundred of those things banging away and they make considerable noise, believe it or not, and the motor noise from them also is considerable.

And by using electronic equipment which I say primarily was introduced because it was so much faster, the noise has been greatly abated. And that, of course, helped our employees I'm sure. I think it increased their efficiency.

Mr. BARON: Thank you.

Dr. MEYER: Thank you very much, sir. We appreciate your coming.

Mr. ABERNATHY: Thank you.

Dr. MEYER: Is Mrs. James Guess present?

(No response)

Mr. James Guess?

(No response)

Is John R. Ballentine of Acoustics Vibration Association present?

(No response)

How about Mrs. Zumbrook representing Decatur Civic Association? I know she's here.

STATEMENT OF RUBY BALLARD ZUMBROOK, DECATUR CIVIC ASSOCIATION

Mrs. ZUMBROOK: I came to learn too. May I just give this statement to the clerk to be entered into the record? Practically everything that I was going to say has been said, and there is another person of the same organization present and I would like for him to make his presentation at my time,

Mrs. **Zumbrook**: —if possible.

Dr. **Meyer**: That's fine.

Mrs. **Zumbrook**: For the senior citizens, they fuss about the radio. The voice level is here (indicating), and the commercial level is there (indicating). And they fuss about it all the time, don't they?

Dr. **Meyer**: We will be happy to have your material for the record.

Mr. **Abernathy**: I didn't quite get that about the radio. I mean your radio reception is under your control, so just what was the question?

(The prepared statement of Mrs. Zumbrook follows:)

A Road Is a Road Is Road—Commercial or Residential?
(And Never the Twain Shall Meet)

It has been encouraging to listen to the research papers and observations concerning noise abatement. It seems that it is all but an accomplished fact that technology will soon engineer the noise out of engines and plan the noise out of buildings.

The old engine can be brought up to standard by mufflers and silencers.

The old building can be retrofitted and brought up to acoustical standards.

So much for the engines and buildings. We can rest assured that the noise levels set for them will be met, because for them:

1. Standards can be made
2. Research can be applied
3. Profit motives can be utilized

Now let's turn our attention to another type of building—those set in rows on grassy plots and tree-lined streets—our homes. Noise on the home front can be as damaging as noise anywhere. Therefore it must be dealt with.

Control of street noise in a residential area starts with:

1. Control of design and placement of the street
2. Control of the type of the facility
3. Control of the type and volume of the traffic

At present there are insufficient standards governing the compatibility of the redesigned streets and areas passed through. *Commerical* streets are planned through *residential* neighborhoods. Many deteriorations of values will result—not the least of which is noise.

Can we apply to residential city streets what is known about buildings? Can we require "curtain walls" of trees? Of grass? Of space? Of Green Belts?

Can we require "baffles" silencer pads, sound barriers in the form of trees in buffer strips between sidewalk and street? Between pedestrian and engine?

Improper traffic on residential streets robs us of a place of rest, a place of tranquility, a place of recovery.

We need neighborhood quietness to rear and train our children.

WE NEED STANDARDS GOVERNING DESIGN AND PLACEMENT OF ROADS. WE NEED PROTECTION

AGAINST TRAFFIC NOISES ON OUR HOME STREETS.

(Hopefully some one will cover the voice levels of TV and radio.)

(The unmuffled motor-bikes are universally shuddered at)

(Little League, football at night and other noisy park-games should be planned away from houses.)

(Barking dogs uncared for usually)

So many noises! I'll vote for any President who will give your office the power to control noise.

Dr. MEYER: Will the other gentleman representing your organization come and join us, sir, and tell us what you have to say? We are glad to have you here.

STATEMENT OF W. E. JOYNER, DECATUR CIVIC ASSOCIATION

Mr. JOYNER: I am W. E. Joyner.

Someone from the newspapers was here yesterday at this meeting, and the silence must have had a considerable effect on him, because when he got back to the office he had to be asked three times what he had learned. So I don't know whether he didn't understand it or whether he didn't hear well.

But I would like to quote one statement from a man who I consider is a very learned individual, and he is concerned with environment. Years ago I heard him say this: "There are many things that we call and do in the name of progress, but if it does not enable the people living in that area to get more and enjoy life better, it is not progress."

So I think we in the pollution area have pretty near reached that stage.

Now, Decatur is an old town and has been called a community of bedrooms I suppose, and there's many things that have been destroying. And I suppose when you get down to saying this kind of pollution or that, it's pretty hard to really separate one from the other.

The first thing I think we are concerned with is what it does to people. In the first place, as an example of noise, how many of you like to go into a restaurant or a place to eat where you cannot even talk in a normal tone to the person sitting across the table from you? Well, certainly that does something to your digestive system.

And the next thing, in those areas where people are constantly bombarded with noise, how many of you had the experience of seeing the irritation that comes about from those individuals because of that kind of noise?

I think that noise also has been pretty well demonstrated—not here but in many, many areas—that people's hearing is impaired. And I think one gentleman this morning mentioned the fact that this young fellow going to work and coming back home, because he heard all the noise all day, has to yell his head off at his family. Well, that's a typical thing.

And if I had known this, I could have brought along a tape on decibels that go from 10 to 5,000 and let you see and understand the difference that the number of decibels affect in the hearing.

Now, I'm sure that if you people have read the *Journal* this week —and this isn't something that is new to most of you—John Crown has stated that rats and certain animals who have been subjected to loud noises have offspring that become deformed or have birth defects.

I have worked in birth defects for quite a number of years, and it is amazing the things that we have no idea or concern about normally that cause birth defects. And I am wondering of the many birth defects that we see examples of every day if noise hasn't had a great deal to do with it.

Now, certainly the quality of living in any community— Well, if you would name a town, here is one that is quiet and here is one with I don't care how many thousand dollars worth of business that is going on, and the average individual wants to live in the one that is quiet.

Now, right out in Decatur we have a problem right now, and the gentleman from East Point I believe it was, or College Park, somewhere, was talking about the effect that the noisy airplanes had on the children in the school. Well, here is a perfect example in Decatur in how they are going to take highway 155 and run it within a half a block of the high school of 1,600 kids and 30 feet from a junior high school with probably 1,000 kids. And how can it not affect them? I don't know how they are going to do it. Because certainly the noise is going to have a tremendous effect on those children.

And so there is another thing. How do we know how the noise is going to affect them today, what it is going to turn into in their later life? What will it make out of them? It could be some deformed offspring could be affected.

And I think that it's the people who have to pay the bill. And you talk about the Federal Government giving them the money to do it, but, brother, don't you forget for one minute that you're paying it. And until we can reach the stage that we can hold up that money and say, "You're going to do what the citizens say or you won't get it," until we reach that stage we're never going to control it.

You can pick up papers from day to day and see the protests that the citizens give from time to time and how little attention is paid to it. And as one gentleman I think said here yesterday—I wasn't here, but on the television or radio last night—we have come to a stage in pollution, air pollution and these other types and, as someone said this morning, it's too late after it has already affected you.

I visited in a town 2 years ago that had an extremely high air pollution. It took me 4 days almost so I could breathe out of my nose in leaving there. Well, not only was the air that way but the noise was the same way, because in the same place there had never been any effort made to cut down the noise or the air pollution, not one. And one big hotel had to completely close up on account of it—noise, and noise only.

So I think that anything that you people can do will help. And certainly I think that in your towns or local communities where you have got motor scooters running up and down the streets, radios— And the only time I ever turn a radio or television on is if I want to hear something specific, for the simple reason that you can be listening to a program and let's say your decibels are (indicating), and let a commercial come on, and, bang, it will knock your ears off almost.

And when the man invents a radio that when that commercial comes on loud like that it will automatically put it back down to its normal level, he's going to make a fortune.

And so I just hope that somebody somewhere along the way is going to get enough control over some of these things that the people who have to pay the bill can have some say in it.

Thank you very much.

Dr. **Meyer**: Thank you very much, sir. I assure you that that's one of the purposes of meetings like this, so we get the views of the people who are paying the bill. That's our job as representatives of the Federal Government. We are servants of the people and we are determined to get these views. Does anybody on the panel have any questions?

(No response)

Thank you very much, sir.

Mr. **Joyner**: Thank you.

Dr. **Meyer**: Is Mrs. Dodd here? Margaret Dodd?

(No response)

If not, is Stephanie Coffin here, who I understand is the ecology editor of a publication? Glad to have you here, Miss Coffin, I look forward to what you have to say.

STATEMENT OF STEPHANIE COFFIN, GREAT SPECKLED BIRD, NEWSPAPER

Miss **Coffin**: We came here to speak about the police helicopter that has been used in Atlanta since early spring. I am Stephanie Coffin from the Great Speckled Bird, the largest weekly paper in Georgia. We feel that our paper is a little bit different than most ordinary daily papers in that we are more in touch with the people we write to. And one community that we relate to specifically is the Tenth Street community or sometimes known as the "hippie district."

Now, one of the things that is deeply troubling this community is the problem of noise pollution, and that is specifically the noise of the police helicopter.

First of all, we must explain that Atlanta has two kinds of helicopters. One is the C & S Bank helicopter, and this helicopter flies around picking up mail and money, and it's really hard to understand how Atlanta would allow a private firm to pollute, you know, cause so much air pollution, just for fulfilling its daily function, business function. But I guess that shows how much power that the C & S Corporation has in this town.

But the more obnoxious helicopter is the police helicopter. And because we live in the Tenth Street community, the police helicopter has somehow made the decision to police our area much more heavier than any other area of the city. And so this means for thousands of residents who live in this area that they have to put up with this noise.

We heard yesterday a man who spoke from the Georgia Trucking Association, and he talked about the establishment of certain truck routes to protect residential areas from noise. Of course, that is not possible with the helicopter. And so, you see, within this area there is no place you can go to get away from the noise.

We also have a very large park called Piedmont Park within the area, and at night thousands of people go there to enjoy the quietness. And that park is a specific target for the helicopter. And the helicopter has also been known to fly over the lake in the park and use its loudspeaker telling people to do this or to do that. So, you see, any kind of quietness in the area is completely broken up.

There is one other thing that I would like to say about the helicopter, and that is that it's a certain kind of noise from the helicopter, and that is it's the same kind of noise from an ambulance or fire truck, and that usually means danger. And I think helicopter noises are very much related to like war. When we see the newsclips on television all the time from Vietnam we see helicopters, you know. We associate them with war, with violence, with danger.

So when I am at my house on Ninth Street sometimes all day I hear this helicopter. It's very, you know, disconcerting. We are afraid that buying helicopters for police use with little regard for the thousands of people who continually live under it will spread to other cities, and we are afraid that other cities will be as unresponsive as ours to the complaints of noise from the people. And we just ask you to mention this grievance in your report and thank you for listening to us.

Dr. Meyer: Thank you very much. Panel?

Dr. Okun: Has this problem actually been brought to the city officials?

Miss Coffin: We have written several articles about it in our paper and there have been several complaints. But I think it has a whole lot to do with the "powerlessness" feeling that exists in the area. And I don't think that there is a campaign, you know, where people are systematically working to stop this right now.

Dr. Okun: In other words, you haven't used the regular channels for complaint—that is, go through the board of aldermen or through your own representatives or any of the official members of the government establishment?

Miss Coffin: As far as I know, that hasn't been done by any group.

Dr. Okun: It might be appropriate.

One additional thing. I found out today that Channel 11 broadcasts every day about some item of pollution and gives the information as to where something might be done about it. Have you approached Channel 11 with this?

Miss Coffin: No.

Dr. Meyer: It has been recognized that noise from helicopters carries with it some connotations of a rhythmic beat, part of the noise characteristic of the helicopter itself, rather than the fear connotation that you are bringing in. And this matter has been studied. In fact, the Federal Aviation Administration, which gets a fair amount of lumps on its head about things, has issued some regulations regarding new helicopters.

One has to ask, some real questions of oneself about the problem you're raising; namely, how often does this come, what's the frequency of stay over an area? And I think you would be doing a great service if you would start documenting some of these things so at least you know what the facts are. At the same time one also has to realize that helicopters are not only useful for the police in, say, law enforcement, but they do have a connotation to some people of rescuing folks who are in trouble. For instance, we rescued some people in some of the national forests, and so on, who otherwise wouldn't have been saved.

So I would say that you have to look at both sides of this. But I wish you would, indeed, as a good citizen, help document what the problem really is, because if these things are being flown too low and are creating noise in a pattern that should not be allowed, there are ways of getting this into public view so that the situation can be corrected. And we will certainly include your remarks in the record.

Miss COFFIN: Thank you.

Dr. MEYER: Thank you very much for coming.

Is Maura Enright here?

Miss ENRIGHT: I am Maura Enright.

Dr. MEYER: Nice to have you here.

Miss ENRIGHT: Thank you.

Dr. MEYER: Did you have anything you wanted to add to this?

STATEMENT OF MAURA ENRIGHT, CRISIS CENTER, ATLANTA, GEORGIA

Miss ENRIGHT: I have something, you know, just to back up what Stephanie said. Also on what you said about documentation, it would have been nice to come here as, you know, representative of a group that had studied this, but the hip community, whatever you want to call it, is already exhausted by a lot of things we are trying to do. We have a great many other harassments besides just the helicopter.

Dr. LYONS: We are having difficulty hearing you. Is that mike on?

Miss ENRIGHT: Our apologies for not having a group that has. But so much other stuff is going through. There's only so many people and there's so much harassment at all different aspects of our life. This is just a beginning. We hope we can carry it out further.

I am from the Community Center, and I just want to back up what Stephanie said. This helicopter noise for me is an important aspect of pollution because of its effects on quality of life—my life, for instance.

Now, the helicopter noise completely disrupts any area it is in. There is no question about that. People on the street, in the park, on their porches, in their houses have no choice but to endure the noise. No amount of mental effort can block it out. It penetrates through walls as well as through conversation, meditation, music, and sleep.

It is especially noxious in the park. It's not a minor concern to the people in our community that the air space in the park is constantly abused by the helicopters. It is a serious encroachment on our right to some kind of silence and relaxation in our lives.

The police helicopters especially do not just pass over but they are very fond of circling around over one given area for long periods of time.

Just the noise of helicopter noise has a certain connotation for most people. When they hear a helicopter see it circling overhead, they don't say, "Far out, we're being protected from natural disasters or from criminals." They get very paranoid. Again quality of their park experience. They are subjected simultaneously to extreme noise and paranoia. This is not right or human.

My last word. It must be argued or may be argued that police helicopters are exciting new tools for law enforcement, but you end up with a "big brother" concept, censors in the brain, closed-circuit TV covering every inch of the planet, etc.

We all know we are at an extremely delicate point in history. We must start considering quality of life and apply it to our technology. The helicopters in Atlanta fall into this category. They must be eliminated or greatly restricted.

That's all I came to say.

Dr. **Meyer**: Thank you very much.

Comments?

(No response)

Thank you.

Is Mrs. Robert Miller here?

(No response)

Or Mrs. Charles Holman?

STATEMENT OF MRS. CHARLES HOLMAN, PRIVATE CITIZEN

Mrs. **Holman**: I apologize if I am repeating something that might have been said yesterday. I was not here and do not know what proceeded yesterday.

I am Mrs. Charles Holman. I am speaking as a private citizen. It seems to me that one factor in noise pollution as related to construction has been overlooked and should be included in the report of this committee. That factor is population.

We have noise because we have people. The noise is to meet the needs of the people. If you have one person, you need one housing unit and one automobile. If you have two people you have two automobiles.

Excuse me. I'm extremely nervous.

Dr. **Meyer**: That's all right.

Mrs. **Holman**: And you need two housing units. Thus, you have doubled your construction, your automobile factory, the automobile that is produced, the highway that is needed for the automobile, and all of the other related factors that go into this.

Therefore, I feel that this committee should emphasize that population must be controlled just to keep noise at the level that it is now without increasing the level of noise.

Thank you.

Dr. **Meyer**: Thank you very much. Would you wait just a minute and see if any of the panelists has a comment or question?

Mr. **Baron**: Are you echoing zero population growth? Is that the point you're making?

Mrs. **Holman**: Yes, sir. I think it's crowded enough just as it is. It has enough noise. It has enough land that has been destroyed for highways, destroyed for housing units. I think that if we can maintain ourselves as we are now we will have done a wonderful thing.

Mr. **Baron**: If I may add a slight note of mixed levity and seriousness, it has been said that noise causes reduction in fertility and virility.

Dr. **Meyer**: The fact still remains, and we were discussing this with some other people earlier today separately, that even if you had a relatively static population one of the problems that we are faced with in all environmental issues, not just the noise issue, is the steady movement of people from rural areas of the United States into the metropolitan and megalopolitan areas. All you have to do is take the *Statistical Abstracts of the United States*, a book put out by the Department of Commerce, and look at the list of cities of over 100,000, and look at the 230-some-odd standard metropolitan areas of the United States, total up the population, and compare that with the total population. You will come up with the fact that about 80 percent of the population is living in about 25 or 30 percent of the land area, and the trend is continuing that way.

So people are just packing themselves into these big metropolitan areas, and this is a real concern. If the national life style is away from the country into the city, then we've really got to take a good look at how to accommodate all of the conflicting desires, aims, mores and aspirations of the population, because not all 200 million people are going to want to feel the same. At the same time, one has to then come up with a rational land use policy in this area. So even if you held the population the same you wouldn't necessarily solve all these problems.

Mrs. **Holman**: Right.

Dr. **Meyer**: In fact, you may have it much worse.

Mrs. **Holman**: I realize that. But one of the primary factors in moving to cities, this type of thing, will have to be done with public relations and changing people's attitudes, just as population control is an attitude-changing phenomenon.

Dr. **Meyer**: Thank you very much. I am glad you brought up this issue because it's one that needs to be kept in view. Let me ask if there were any of the people who indicated they wanted to make a statement who were late when I called their names here? If so, I will be happy to have them appear at this time.

(No response)

If not, I will make the statement that I have indicated before. The record of this hearing will stay open for 30 days until the 9th day of August, and if anybody who is here feels that they would like to have something included in the record, if they will address a letter to us at the Environmental Protection Agency at 1626 K Street, N.W., Washington, D.C., we will ensure that it is included in the published record.

(Statements of Robert L. Schwind, The Georgia Conservancy, Inc., and Furman Smith, Jr., as an individual, follow:)

STATEMENT OF ROBERT L. SCHWIND

I have been requested by the Georgia Conservancy to represent the Conservancy at the above-captioned hearing. I have been called out of town on the dates of the hearing and shall be therefore unable to attend in person. Accordingly I wish to present this statement on the subject of noise pollution with the request that it be incorporated into the official record of the hearing.

As you may know, The Georgia Conservancy, Inc., is a non-profit tax-exempt corporation created in 1967 and existing under the laws of Georgia. Its membership is currently near 5000 and its expenses are met from membership dues and donations. The Conservancy represents and is made up of Georgians from all walks of life dedicated to the wise use of our natural resources and to the restoration and preservation of the harmony between man and his environment.

Most of the Conservancy's membership including the writer live and work in an urban environment and are well aware of the increasing cacophony assailing us from all quarters, to wit: transportation and vehicular traffic, industry and business, and the construction industry. The Conservancy does not accept the proposition that noise is the price one must pay for progress or that noise is an inevitable and necessary concomitant of urban life and affluence, but is of the opinion that noise like any other pollution proceeds from wrong attitudes i.e. from a general disregard or lack of sensitivity for the right of all to enjoy a healthy environment. Stated otherwise, most sources of noise pollution could be, with the present state of technology, controlled, if not in many cases entirely eliminated, were the creators of such pollution so minded.

The writer, a lawyer by profession, is not qualified to comment on the medical or physiological effects of noise pollution, nor on the noise ordinarily associated with industry and construction. Accordingly, comments in this statement are limited to those sources of noise pollution with which the writer is personally familiar, namely transportation and vehicular traffic. For convenience, each category will be treated separately.

1. Diesel trucks: The motors of diesel trucks generate considerable noise. With increasing numbers of trucks on the highways and the expansion of the highway system, ever more peoples' lives are affected by noise pollution. Those living within two miles of a major highway are subjected to the continual din of diesel engines. From personal observations the writer can testify that most truckers make a practice of removing the mufflers from trucks upon receipt from the manufacturer and replacing the same with straight exhaust pipes or with phony mufflers without baffles. The reason for this practice is the widespread belief among truckers that mufflers impair the efficiency of diesel engines.

2. Diesel locomotives: Like diesel trucks, diesel locomotives have no noise suppression equipment. In addition, the practice of engineers to sound their horns vigorously and often even after passing an intersection contributes to the discomfort of people living near railroads.

3. Commercial and private aircraft: Aircraft contain no noise suppression equipment. The continual roar of jet planes over the metropolitan area and the grinding of slower moving private craft at low elevations add substantially to the discomfort of urban dwellers.

4. Sport cars and motor bikes: Many who are attracted to sport cars and motor bikes equate noise with status and power. Accordingly the more noise a vehicle makes, the better it is. Others remove mufflers from regular cars in order to attract attention or to "improve the efficiency" of such vehicles. State laws governing the use of mufflers, if they exist, are not enforced.

The Conservancy is of the opinion that the technology exists to provide most modes of transportation with noise abatement equipment. Moreover since most of these modes of transportation are involved in interstate commerce or affect interstate commerce, they are a proper subject for Federal regulation. As evidenced by the attached letter from the U.S. Department of Transportation to the writer, that agency does not appear ready to regulate noise abatement for commercial vehicles. Accordingly one must look to the Environmental Protection Agency for aid in meeting the assault on the auditory senses. In summary, The Georgia Conservancy, Inc., representing and uniting Georgia's conservationists in the common cause of improving the quality of the environment and of our lives, expresses for the record of this hearing its support for the Agency's effort to abate noise pollution and urges the Agency to proceed with the formulation of policies and regulations designed to meet that problem effectively.

Text of
LETTER TO MR. SCHWIND
From
Federal Highway Administration

Dear Mr. Schwind:

Your letter of May 25, 1971, addressed to Honorable John A. Volpe, Secretary of Transportation, has been forwarded to this office for reply.

We agree that improperly maintained commercial vehicles can be responsible for noise levels which are disturbing to private citizens and perhaps damaging to drivers of motor vehicles. This Bureau recently issued an Advance Notice of Proposed Rule Making on the subject of Vehicle Interior Noise Levels. Although the proposal does not deal with commercial vehicle noise as a contributor to environmental pollution, in focusing on the noise to which the truck or bus driver is exposed, it is expected that the total noise level of the vehicle will be reduced. We are enclosing a copy of the Advance Notice and a press release discussing it for your information. The proposal would amend the Motor Carrier Safety Regulations which are concerned with the safety of operation of motor vehicles used in transportation in interstate and foreign commerce.

A number of States in their Motor Vehicle Codes specify general noise level requirements. The States of New York and California have enacted legislation that specifically limits motor vehicle noise levels and specifies the manner in which it is to be measured. We feel that at this time State regulations enforced by State authorities represent the most effective method of controlling excessive noise from commercial vehicles whether traveling intrastate or interstate.

ENCLOSURE TO LETTER

FOR SATURDAY RELEASE
November 21, 1970

FHWA - 527
(202) 426-0648

For the first time, the Department of Transportation is contemplating setting standards to control the noise level inside trucks and buses.

Dr. Robert A. Kaye, Director of the Federal Highway Administration's Bureau of Motor Carrier Safety, today announced that the BMCS is considering rule-making action aimed at decreasing the noise level inside the cabs of commercial vehicles.

Pointing out that potential safety hazard can be created by high noise levels in the cab of a truck or bus engaged in sustained highway travel, Dr. Kaye said:

"The more pressing and direct hazard is the effect of extended high noise levels on drivers' alertness, while behind the wheel under certain circumstances. There is also a possible long-run personal occupational hazard of damage to drivers' hearing, therefore serious consideration of Federal regulatory action is warranted."

Comments on the feasibility of regulations, based on standards of the Society of Automotive Engineers or on safety and health standards set by the Department of Labor under the Walsh-Healey Public Contracts Act, are being requested from all interested parties.

The proposal does not deal directly with commercial vehicle noise as a contributor to environmental pollution. However, in focusing on the noise to which the truck or bus driver is exposed, it is expected that the total noise level of the vehicle will also be reduced, thus having a secondary effect of decreasing environmental noise pollution.

Recognizing that a noise level test on a stationary vehicle, rather than a moving vehicle, would be much simpler and less costly for both motor carriers and enforcement personnel, Director Kaye specifically requested information on whether there is a reasonable correlation between the sound level when the vehicle is stationary, with its engine operating, and when it is operating on the road at highway speeds.

All interested persons are invited to comment on the proposal on or before February 19, 1971. Comments should be submitted in three copies to the Bureau of Motor Carrier Safety, Federal Highway Administration, Room 5306, 400 Seventh Street, S. W., Washington, D. C. 20591.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF MOTOR CARRIER SAFETY
WASHINGTON, D.C. 20591

PROPOSED RULE MAKING

Federal Highway Administration
[49 CFR Parts 392, 393, 395]
[Docket No. MC-22; Notice No. 14]

VEHICLE INTERIOR NOISE LEVELS

Advance Notice of Proposed Motor Carrier Safety Regulations

The Director of the Bureau of Motor Carrier Safety is considering rule making for the purpose of reducing the risk that drivers of commercial motor vehicles will incur damage to their hearing or undue fatigue because of the level of vehicle-generated noise to which they are subjected when they operate those vehicles. Evidence that interior noise levels are so high as to cause damage to drivers' hearing or to decrease their vigilance behind the wheel may require the adoption of rules prescribing maximum interior sound levels for commercial vehicles and hours-of-service limitations, in addition to those now found in Part 395 of the Motor Carrier Safety Regulations, restricting the duration of drivers' time behind the wheel of vehicles that produce interior sound levels above a prescribed standard or both.

Several existing criteria for determining the adverse effects of exposure to noise in a working environment are under consideration. Among them are the octave band pressure levels found in Society of Automotive Engineers Recommended Practice J336 ("Sound Level for Truck Cab Interior," June 1963) and the standards issued by the Department of Labor under the Walsh-Healey Public Contracts Act relating to occupational noise exposure of employees covered by the Act (see 41 CFR 50-204.10). The Director invites comments on the feasibility of adopting these, or other similar, existing criteria.

The Director will also explore the possibility of employing various existing methods of measuring sound levels to ascertain whether interior noise in a vehicle exceeds permissible limits. He is contemplating monitoring either octave band levels in decibels or decibels on the A-weighted scale as reasonably accurate measurements of the effect of noise on human beings working in close proximity to the source of the noise. The Director invites comments on the feasibility and validity of using either or both of these monitoring techniques for that purpose.

The Director recognizes that it would be simpler and less costly for motor carriers, vehicle manufacturers and enforcement personnel to make tests in a stationary vehicle rather than a moving one. He will, therefore, consider the possibility of measuring sound levels inside stationary vehicles, with the engine at idle or at a governed speed with the transmission disengaged, as the test for ascertaining whether the noise levels of those vehicles are unacceptably high when they are moving. Comments on the feasibility and validity of this approach are invited. The Director is particularly interested in receiving comments on the hypothesis that, because most of the noise heard inside a moving vehicle is generated by the engine rather than by wind or the vehicle's tires, there is a reasonable correlation between the sound level when the vehicle is stationary, with its engine operating, and the sound level the vehicle's driver experiences on the road at highway speeds.

Because issuance of a regulation can result in technological improvements in vehicles manufactured in the future, the Director is considering issuance of a rule that would establish two standards for maximum permissible interior sound levels. One standard would apply to vehicles manufactured before a prescribed cutoff date, while another more stringent standard would apply to vehicles manufactured after that date. The two-standard approach would assure that the motor carrier fleet will, in time, achieve a more desirable level of performance, so far as interior noise is concerned, without at the same time rendering a substantial segment of the existing fleet obsolete overnight. Comments on the feasibility of this approach are specifically invited.

The Director also invites interested persons to submit data on sound levels in present production over-the-road vehicles and on sound levels in models of those vehicles projected for future production. In addition, he invites submission of information about hearing loss and driver fatigue as a function of exposure to noise at various sound levels.

Data, views, and arguments on subjects pertaining to the proposed new rules, other than those specified above may also be submitted for consideration.

All comments should refer to the docket number and the notice number appearing at the top of this notice. Comments should be submitted in three copies to the Bureau of Motor Carrier Safety, Federal Highway Administration, Room 5306, 400 Seventh Street SW., Washington, D.C. 20591. All comments received before the close of business on February 19, 1971, will be considered before further action is taken. Comments will be available for examination in the public docket at the above address both before and after the closing date for comments.

This advance notice of proposed rule making is issued under the authority of section 204 of the Interstate Commerce Act, as amended (49 U.S.C. 304), section 6 of the Department of Transportation Act (49 U.S.C. 1655), and the delegations of authority in §§ 1.48 and 389.4 of Title 49, CFR.

Issued on October 28, 1970.

ROBERT A. KAYE,
Director,
Bureau of Motor Carrier Safety.

[F.R. Doc. 70-15034; Filed, Nov. 6, 1970; 8:51 a.m.]

STATEMENT BEFORE HEARINGS OF ENVIRONMENTAL PROTECTION AGENCY, JULY 8 AND 9, 1971—ATLANTA, GEORGIA

My name is FURMAN SMITH, JR. I reside at 4400 Northside Drive, N.W., Atlanta, Georgia 30327. I make this statement not as an expert, but as an individual who desires to bring attention to what he considers to be the most obnoxious and pervasive sources of noise pollution.

From my own experience, I find that the noise generated by vehicular traffic, automobiles, trucks, buses and motorcycles, is by far the most obtrusive and pervasive source of all forms of noise pollution. And of all motor vehicles, large trucks are by far the worst offenders. As an example, I find that I am constantly disturbed, annoyed and irritated by the noise from large trucks travelling on Highways I-75, particularly in the evenings and at night. It is almost *two miles* in a straight line to this Highway at the nearest point! I cannot count the nights that I have been kept awake listening to heavy trucks labor up a steep grade on I-75. I can distinctly hear these trucks as they go through their range of gears. I do not know why, but I never noticed this level of noise before I-75 was completed. I-75 runs right alongside old U.S. 41, which also was heavily traveled by trucks before the construction of I-75. However, U.S. 41 was at that time heavily wooded almost to the edge of the road on both side. All of the trees have been stripped away for almost a quarter of a mile on each side of I-75.

The problem appears to be caused almost entirely by trucks. Automotive traffic on the street in front of our house, which is a through street, is almost completely unnoticeable. The truck traffic on I-75 is quite noticeable. In fairness, however, I should point out that traffic on I-75 cannot be heard at all times; it is particularly noticeable on warm nights.

I personally find that the noise from trucks is far more obtrusive and pervasive than the next major source of noise pollution, aircraft. Our house is under the flight path of planes from Dobbins Air Force Base and from Atlanta Municipal Airport. Nevertheless, noise from aircraft hardly disturbs me at all, especially when compared to truck noises. Aircraft noises are, fortunately, only occasional. The truck noise is almost continuous. Although I have never made scientific measurements, the noise from a large truck climbing a steep grade appears to be almost as great as a commercial aircraft on take-off.

However, it is possible to live away from airports; it is almost impossible to get away from super highways. When the proposed interstate and tollway system is completed, there will be almost no point in the greater Atlanta area which will be much more than two miles from one super highway or another.

It appears to me that this is a problem which could be greatly alleviated by simple controls. Some heavy trucks appear to have almost no mufflers at all; others appear to operate much more quietly. In fact, until this year, Georgia did not require truck tractors to have mufflers at all. I would like to see federal regulation which would prohibit any vehicle from using the interstate system if it at any time generated noise levels exceeding a realistic maximum.

Dr. **Meyer**: I do appreciate the fact that so many people have stayed with this group for as long as they have, and I hope it has been as useful and informative to you as it has been to me as the chairman and representative of the Administrator and to the members of the panel. Thank you all very much.

(Whereupon, at 2:50 p.m., the public hearing was adjourned.)

* * *

APPENDIX A

MISCELLANEOUS STATEMENTS FOR THE RECORD

STATEMENT OF MARVIN H. CLOER, ALLIANCE FOR LABOR ACTION

THE NOISE AROUND US: HAZARDS AND CURES:

We have heard a lot about pollution in our environment and the harmful effects it can have on everyone. In the last few years there has developed a better understanding that the noise around us is a form of pollution, and that noise pollution is harmful to human health and well-being—not only is it the major cause of deafness but is also a contributing factor to the psychosomatic stresses and strains in urban areas.

The ALA is seriously interested in action by the Government and industry to curb this noise.

Various Health Journals and Newspapers over the Country acclaim that the greatest non-killing health hazard in American industry is noise-induced hearing lost involving at least six million with estimates up to 16 million workers. It is painless, does not bleed, cannot be seen, appears gradually and one is unaware that the daily temporary loss will become permanent in time.

Acoustical Violence—Threat to Health

From the book "Tyranny of Noise" which seems to be a writing of various studies done in various cities on noise, points out the facts that not only is hearing affected but cardiovascular problems, ulcers, the irritable colon, the erratic blood pressure, migraine headache and a great deal of mental illness.

Dr. Rene Dubos noted Microbiologist and authority on the ecology of disease states "Modern man, like his ancestors, can achieve adjustments to a very wide range of conditions even those that are almost incompatible with organic survival". He also states—"Noise is one of the stresses to which man becomes "adjusted" by becoming literally deaf to it."

Dubos has a warning against crowding: He says that tests have revealed that crowding increases activity of hormones, and adrenal glands which in turn affects the whole human physiology."

Noise Pollution in the Work Place:

Some communities have done nothing whereas others have been misguided in their efforts and have aggravated the environmental conditions of many workers such as forbidding windows in plants joining residential neighborhoods which only trapped the noise for the workers.

Industries where ALA members work have become seriously aware of noise hazards yet in all ALA industries noise abatement programs are in their infancy. While there is some progress of noise pollution there are other areas which constitutes disaster or near disaster. *Examples*: Drop-forge plants of 60 employees with from 5-25 years of seniority over half have suffered hearing loss varying from 40% to 70%. *Stamping Plants*: The noise here is terrific but is avoidable, a result of negligence and/or indifference on the part of industry and among workers that take it for granted. *Foundries*: A major noise problem. Every worker including clerks are affected. Ear plugs could be effective if fitted to each worker by a plant medical department.

What can be Done?

ALA could schedule after work or week-end meetings with few in attendance. Local Unions could request joint meetings with management which would cut into production time. So it will be up to educational programs in the ALA to give stronger emphasis to the importance of combating noise as well as other forms of pollution in work environment.

Federal leadership is going to be imperative. The remedy lies in public insistence, happily reflected in Congress that Federal authority assume its full responsibility.

To summarize, let me emphasize that construction is an industry that also has been allowed to run rampage throughout the community day and night having no regard for the tranquility of residents living and sleeping, without even being made to feel any responsibility to anyone in the field of noise pollution.

July 20, 1971

Dr. Alvin F. Meyer Jr.
Environmental Protection Agency
Noise Abatement Division
Washington, D. C. 20460

Dr. Meyer, members of the panel, Ladies and Gentlemen.

Fourteen years ago I purchased a home in Cobb County, Georgia. This is the largest investment I will make in my lifetime. It was a home I could enjoy and look forward to the retirement years ahead. Noise, smoke and dust pollution was a problem not related to my home environment. Today this is changed. Due to negligent and indiscreet zoning, a concrete construction